THE CONTENTS OF THIS SECTION ARE
THE HIGHEST QUALITY AVAILABLE

INITIAL KH DATE 8/10/04

Appendix C

Project Calculations and Analyses

CONTENTS

Document ID: PEI-EDF-1000
Revision ID: 0
Effective Date: 03/31/04

Engineering Design File

Independent Review and Analysis of Excavation Slopes

Portage Project No.: 2073.00
Project Title: PM-2A Remediation Phase I

Portage ENVIRONMENTAL

TEM-0104
03/30/2004
Rev. 0

ENGINEERING DESIGN FILE

BO
03/31/04

1. Portage Project No.: 2073.00 2. Project/Task: PM-2A Remediation Phase I

3. Subtask: Tank Excavation

4. Title: Independent Review and Analysis of Excavation Slopes

5. Summary:

The purpose of this analysis is to review and revise (if necessary) preliminary recommendations for temporary excavation slopes and soil-bearing pressures to meet currently planned design constraints associated with removal of the PM-2A tanks. Soils and subsurface conditions are based upon the original analysis by Intrepid Technology & Resources, Inc., while new information regarding the crane and excavation plans is considered. This analysis shows that the proposed design of 1.5:1 (horizontal to vertical) slopes on three sides of the temporary excavation and a 1:1 slope at the north side provides a sufficient factor of safety against failure for the anticipated working conditions. A maximum allowable soil-bearing pressure of 5,000 psf is recommended for the crane pad surface.

6. Distribution: (Portage Environmental, Inc.)

Lisa Aldrich, PEI Document Control (Original)
Brady J. Orchard, P.E.
Clement Potelunas, P.E.
Ray Schwaller, P.E.
Jeff Towers

7. Review (R) and Approval (A) Signatures:
(Identify minimum reviews and approvals. Additional reviews/approvals may be added.)

	R/A	Printed Name/ Organization	Signature	Date
Author	A	Ray Schwaller, P.E.	Ray Schwaller	3/30/04
Independent Review	R	Clement Potelunas, P.E.	Clement B. Potelunas	3/31/04
Project Manager	R/A	Brady J. Orchard, P.E.	B. Orchard	03/31/04

CONTENTS

1. INTRODUCTION AND PURPOSE

Two buried tanks identified as the PM-2A tanks at Test Area North (TAN), Idaho National Engineering and Environmental Laboratory (INEEL) Site are to be removed as part of an environmental remediation project. Tank removal will involve a temporary excavation around the tanks such that the tanks can be removed whole and transported to the TAN-607A High Bay for subsequent treatment prior to disposal. Excavation slope stability is an important safety consideration.

The main purpose of this evaluation is to conduct an independent slope stability analysis to determine if the proposed slope design provides an adequate factor of safety (FOS) against failure. For purposes of the slope stability evaluation, it is assumed that a FOS of 2.5 is acceptable.

Another INEEL Subcontractor (Intrepid Technology & Resources, Inc. [Intrepid]) previously performed slope stability analyses for the subject site. Information from the previous analysis is used as a basis for the independent review of slope stability. The scope of this evaluation is limited to using existing soils and subsurface data found in Engineering Design File (EDF), EDF-096-017, "PM-2A Tank Excavation Slope Stability" (see Appendix A). Additional information regarding the currently proposed excavation plan and proposed crane was provided by Mr. Brady Orchard, Professional Engineer, Portage Environmental Inc.'s project manager for the PM-2A remediation project.

Soil-bearing capacity for the crane pad is also an important safety consideration. This analysis also reviews the earlier work by Intrepid and proposes a revised maximum allowable bearing pressure for the crane pad surface based on the proposed crane and orientation.

2. DESIGN DATA

This section describes the soil, subsurface, and excavation design data used for the reported slope stability and bearing capacity analyses.

2.1 Soils and Subsurface Conditions

Soils and subsurface conditions are described in the following subsections.

2.1.1 Soils

Soil characteristics are described in EDF-096-017, "PM-2A Tank Excavation Slope Stability" (see Appendix A). Fifteen soil samples retrieved from depths ranging from 1.5 to 24.5 ft were tested by the INEEL Materials Laboratory. The samples were tested for physical properties including particle size distribution, Atterberg limits, and moisture content. The soils were classified according to the Unified Soil Classification System. Of the 15 samples, 14 were classified as CL (lean clay with sand or sandy lean clay) and one was classified as SC (clayey sand). Soil moisture content ranged from 10.1 to 20.5%. Sand content varied from 11.8 to 50.4% in the 15 samples.

2.1.2 Subsurface Conditions

Subsurface conditions are described in EDF-096-017, "PM-2A Tank Excavation Slope Stability" (see Appendix A). Two test boreholes were drilled by hollow stem auger methods from ground surface to 24.5 ft below ground surface. Standard penetration tests per American Society for Testing and Materials (ASTM) D 1586 were conducted at approximately 3-ft intervals. Based on corrected N-values ranging from 16 to 89, the consistency of clay soils are very stiff to hard (Lambe and Whitman 1969).

2.2 Design Parameters

The following subsections describe design parameters used for slope stability and bearing capacity analyses.

2.2.1 Slope Stability

Soil shear strength can be estimated from the corrected N-value (derived from drilling blow counts) by

1. Correlating the standard penetration number (corrected N-value) to the unconfined compressive strength of saturated clay

2. Calculating the soil shear strength as half of the unconfined compressive strength.

This analysis, by its mathematical derivation, assumes the soil has no angle of internal friction (i.e., $\Phi = 0$). The shear strength determined by Step 2 above is applied in modeling as the undrained cohesion, c_u. Assuming soil moisture conditions are not allowed to vary significantly upon excavation, a minimum undrained cohesion of 2,000 pounds per square foot (psf) is used for the slope stability analysis.

Preliminary design information indicates the slope height will be 17 ft deep, with three slopes excavated to 1.5:1 (horizontal to vertical) and the project north slope excavated at 1:1. No groundwater or excess pore water pressures are used in the analysis. Moist unit weight of the embankment soil is assumed as 110 pounds per cubic foot (pcf). Preliminary design information is included in Appendix B.

2.2.2 Crane Pad Bearing Capacity

The field investigation report indicates that corrected N-values for the uppermost 12 ft (three times the crane track width of 4.0 ft) range from 24 to 89, with an average of 31 after eliminating the highest value. Based on this and the method used in Section 2.2.1, a minimum undrained cohesion of 4,000 psf is used for the bearing capacity analysis.

2.2.3 Crane Loads

Preliminary design information indicates the crane will be a Manitowoc Model 2250 Crane with the MAX-ER™ 2000 counterweight system. The maximum load imposed to the crane pad by the crane structure is nearly 450 tons. Maximum ground pressures (below the

crawler tracks) used for analysis are 4,200 psf. Appendix B includes the crane weight and ground pressure estimates.

3. ENGINEERING ANALYSIS

This section summarizes the methods and results of the engineering analysis conducted for slope stability and bearing capacity.

3.1 Methods

Evaluation methods are described in the following sections.

3.1.1 Slope Stability

The University of Texas Analysis of Slopes, Version 3 (UTEXAS3) computer program (Wright 1991) was used to evaluate the minimum FOS for a variety of conditions. The computer program uses Spencer's procedure for evaluating static force equilibrium by the method of slices. The program uses an iterative procedure to evaluate numerous potential failure surfaces. The minimum FOS was computed for a circular failure mode with the shear surface passing through the toe of the excavation. The UTEXAS3 program identifies the failure surface location by listing the center coordinates of the failure circle in an output file.

3.1.2 Crane Pad Bearing Capacity

Bearing capacity calculations are based on standard Terzaghi theory for soil-bearing capacity of shallow strip foundations. The crane track width and maximum bearing pressure are applied with no overburden soil pressure to determine the ultimate bearing capacity. Using a FOS of 3.0, a minimum allowable bearing capacity incorporating both local and general shear failure modes is determined.

3.2 Results

For comparison between the SNAILZ model used by Intrepid and the UTEXAS3 model, the first six trials list results for identical geometric, loading, and soil strength conditions. Results are summarized in Table 1 of Appendix C. Appendix C also provides an example output from the UTEXAS3 model, specifically for Trail 19. All other model outputs are on file at Portage Environmental, Inc. The UTEXAS3 modeling trials generally produce a slightly lower FOS than the SNAILZ results. This is likely because UTEXAS3 searches for the lowest FOS within circular failure modes, whereas the SNAILZ results show noncircular failure modes.

With the internal angle of friction reduced to zero while maintaining the undrained cohesion value, the minimum FOS remains greater than 2.5 for the same scenarios that were modeled by Intrepid.

The proposed north slope geometry (17 ft at 1:1) has a high FOS if no equipment is allowed near the crest. Equipment loads reduce the FOS, but the FOS remains greater than 2.5 for the modeled conditions.

The maximum allowable bearing capacity for the crane pad is 5,000 psf (see Appendix D).

4. CONCLUSIONS AND RECOMMENDATIONS

This section discusses conclusions and recommendations associated with this report.

4.1 Soil Moisture Conditions

It should be noted that although unconfined compression tests are sometimes conducted on unsaturated soils, the unconfined compressive strength (and, therefore, the soil shear strength) rapidly decreases with the degree of saturation (Das 1984). Therefore, if the soil moisture content increases significantly, soil shear strength could be greatly reduced.

No direct shear or triaxial shear tests were performed on the project soils. The soil physical properties test results suggest that the soil strength parameters likely include both internal friction angle and cohesion components. For comparison to other results, minimum soil strength parameters are assumed in this analysis (as phi = 15 degrees and c = 250 psf). Applying these "worst case" soil strength parameters by modeling indicates that the slope would be marginally stable without equipment loads and could fail under certain conditions.

Based on the foregoing, soil moisture conditions must be closely monitored in the field during the work. Work should not proceed if exposed slope materials become saturated.

4.2 Crane Pad

It is recommended that the crane crawler tracks should be either: (1) oriented perpendicular to the excavation slope crest, or (2) if parallel to the slope crest, then positioned a minimum distance of 20 ft from the slope crest.

4.3 Other Considerations

The designed slopes (1.5:1 on three sides and 1:1 to the north) under existing conditions provide a reasonable FOS for the temporary excavation. It is recommended that equipment should avoid traveling on the ground surface between the north side of the excavation and Snake Avenue.

Crane equipment ground pressures should be checked against those assumed in this report by consultation with the crane equipment supplier. If ground pressures are expected to exceed the design pressures, the slope stability analysis must be reevaluated by running additional UTEXAS3 trials.

5. LIMITATIONS

This report has been prepared in accordance with generally accepted geotechnical engineering practices in this area within project constraints. Preliminary recommendations submitted in this report are based upon data obtained from a limited number of test boreholes.

Conclusions and recommendations presented in this report assume that site conditions do not substantially differ from those exposed during the subsurface investigations.

The earthwork phases of construction should be periodically monitored by a qualified professional engineer. This is to ensure subsurface conditions are compatible with those used to develop geotechnical engineering analyses and recommendations. Daily monitoring during construction should be done by a competent person responsible for the work. Specific conditions to monitor for include seeps, saturated soils, anomalous soil types, and any evidence of slope movement such as bulging or sloughing.

This report should be made available to prospective contractors for information on factual data only, and not as a warranty of subsurface conditions. Additional investigation by bidders and contractors is encouraged for developing bids and confirming subsurface conditions for construction purposes.

6. REFERENCES

ASTM D 1586, 1992, "Penetration Test and Split-Barrel Sampling of Soils," American Society for Testing and Materials.

Das, Braja M., 1984, *Principles of Foundation Engineering*, PWS Publishers, Boston, Massachusetts, 02116.

Lambe, T. William, and Robert W. Whitman, 1969, *Soil Mechanics*, Massachusetts Institute of Technology, John Wiley and Sons, Inc.: New York.

Wright, Stephen G., 1991, *UTEXAS3, A Computer Program for Slope Stability Calculations*, Shinoak Software, Austin, Texas.

Appendix A

PM-2A Tank Excavation Slope Stability

See the attached document, EDF-096-017, "PM-2A Tank Excavation Slope Stability."

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ENGINEERING DESIGN FILE

EDF-096- 017
Rev. No. _____

EDF Title: PM-2A Tank Excavation Slope Stability

Project No.: 2000-096	Project Title: OU 1-10, Group 3

Problem Statement: The excavation required to remediate the buried waste storage tanks (V-13 and V-14) in the TSF-26 area needs to be designed to provide a stable excavation. The excavation will be approximately 19 feet deep, with an 85' x 59' working surface in the bottom of the excavation. The access ramp will exit the excavation on the Northeast side.

Summary of Conclusions: 1:1 slopes shall be maintained in the excavation. Spoils piles must be maintained a minimum of 20 feet from the edge of the excavation, and no vehicular traffic shall be permitted within ten feet of the top of the slope.

Review and Approval Signatures:

		Printed Name	Signature	Date
Prepared by:		J. SHAUN DUSTIN		10-2-3
Checked by:		KEVIN SHABER		12/3/03
Approval:		GARY MECHAM		12/3/03

Distribution:

Professional Engineer's Stamp (if required)

intrepid technology & resources incorporated

ENGINEERING DESIGN FILE

EDF Title: PM-2A Tank Excavation Slope Stability		EDF-
Project #:	Discipline #:	Rev. No.
Project Title:		Page 1 of 2

Design Basis: The slopes must meet the requirements of CFR Title 29, Chapter XVII, Section 1926.652. Check using SNAILZ slope stability analysis package.
Assumptions: Soil is treated as homogeneous mixture with the uniform characteristics of the weakest identified layer; others as outlined in the appendices.
References: Mfg. data as incorporated. Project documents. Principles of Geotechnical Engineering (3rd ed), Braja M Das, PWS Publishing, 1995. Additional references as included in the EDF.
Calculations/Analysis: See attached calculation sheets

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incorporated

Document No. 2000-096-05

ENGINEERING REPORT

DESIGN OF EXCAVATION SLOPES FOR PM-2A TANK REMEDIATION

Rev 2

INTREPID Task No. 2000-096-05

2 October 2003

Prepared By: Shaun Dustin, PE

Intrepid Technology & Resources, Inc.
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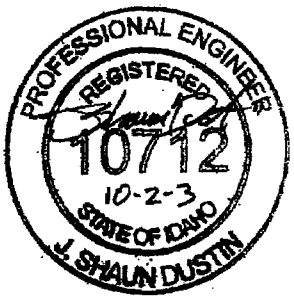
(208) 5529-1014 (fax)

TABLE OF CONTENTS

This report was prepared under the responsible charge of a Professional Engineer as indicated by the seal and signature provided below:



1.0 Project Description

ITR has been contracted to provide an engineering design for the remediation of the PM-2A tanks at TAN. The tanks contain radioactive sludge left over from operations in building 607-B at TAN.

The purpose of this design is to determine the allowable slopes for the temporary excavation around the tanks, and to provide recommendations for the required earthwork.

2.0 Design Criteria

Dimensions: The excavation must be large enough to provide working room around the tanks as shown in the attached drawings.

The tanks are 55' long and 12.5' in diameter, (see Figure 1) with the bottoms of the tanks at an estimated elevation of 4755 ft, and the existing ground surface between 4777 and 4780 feet. The bottom of the excavation will be located at the springline of the tanks, approximately elevation 4461. For the purposes of slope stability analysis in this EDF, the maximum depth of 19 feet (4780-4761) will be used.

The excavation footprint and spoils pile locations are as shown in Figure 2. The crane used in developing the loads used in the model, a Grove GMK5240 with 97,000 lb ballast will, at the critical case, apply a load of 129,000 lbs to 8'x8' timber cribbing located at least 22 feet from the edge of the excavation. In the model, this will be treated as a distributed load on a 1 ft wide strip running from 22 feet from the edge of the excavation to 30 feet from the edge of the excavation. The perimeter fence may not be interfered with.

If any portion of the proposed work fails to comply with the assumptions stated above, the slope stability must be recalculated using the changed conditions.

3.0 Analysis Techniques

The design must meet the criteria imposed by CFR Title 29, Chapter XVII, Section 1926.652, which gives simplified procedures for determining maximum slopes for embankments depending on soil types for embankments under 20 feet, and requires design by a professional engineer for embankments over 20 feet. This excavation is 19 feet deep, and the CFR method was used. The following methodology was used to gather the required data:

Data Collection

Shaun Dustin, PE, of ITR specified the following data collection program:
Field Sampling Program:
1) Drill one borehole within the known fill, and a second borehole outside the known fill at the

4 TANK Steel Plating Thickness REPORTED to be 1/2"

Grove GMK5240 - Hydraulic Truck Crane	240 ton
Gross Vehicle Weight	133,900 pounds
Maximum Counterweights	154,300 pounds
Outrigger Status - Extensions	100% 27'3" Spread
Crane Rotation Status	360 degrees

		Horizontal Distance - Crane to Tank			*Lift Capacity*	*Percent Loading*	
V-13	East Tank	80.0	h-lineal feet		53,000	49.5%	4
V-14	West Tank	100.0	h-lineal feet		36,000	72.9%	4
RUBB THA	26.2' x 65.0'	110.0	h-lineal feet	7,175	32,200	22.3%	4
Precast "C" Shape		110.0	h-lineal feet	22,728	32,200	70.6%	

Long High Capacity Trailers Available ==> 2003 Fontaine Specialized TDFT Telescopic Step, Drop Decl Extendable
102" wide / 48'-69' deck / 80,000 lbs capacity

6 TAR Coating Thickness CONFIRMED to be 1/16"

		Horizontal Distance - Crane to Tank			*Lift Capacity*	*Percent Loading*	
V-13	East Tank	80.0	h-lineal feet		53,000	50.4%	4 & 6
V-14	West Tank	100.0	h-lineal feet		36,000	74.3%	4 & 6
RUBB THA	26.2' x 65.0'	110.0	h-lineal feet	7,175	32,200	22.3%	
Precast "C" Shape		110.0	h-lineal feet	22,728	32,200	70.6%	

7 TANK Steel Plating Thickness CONFIRMED to be 5/8"

Revised Crane Lift Capacity Loading ==>

		Horizontal Distance - Crane to Tank			*Lift Capacity*	*Percent Loading*	
V-13	East Tank	80.0	h-lineal feet		53,000	63.1%	7 & 6
V-14	West Tank	100.0	h-lineal feet		36,000	92.8%	7 & 6
RUBB THA	26.2' x 65.0'	110.0	h-lineal feet	7,175	32,200	22.3%	
Precast "C" Shape		110.0	h-lineal feet	22,728	32,200	70.6%	

Technical Specifications for Grove Mobile Hydraulic Crane GMK6350 [350 ton crane]

Boom Extension (h-lineal feet)	*Boom Distance (h-lineal feet)*	*Boom Angle (degrees)*	*Lift Capacity (lbs)*	*Whole Tank* 66,851 *(lbs)* Percent Lift Capacity	*Half Tank* *33,425* *(lbs)* Percent Lift Capacity	
106.0	90.0	31.9	62,000	107.8%	53.9%	7 & 6
124.0	100.0	36.2	51,000	131.1%	65.5%	
142.0	110.0	39.2	46,000	145.3%	72.7%	
151.0	120.0	37.4	40,600	164.7%	82.3%	

Distance from C/L Crane to C/L of Load ==> (h-lineal feet)

Grove GMK6350 - Hydraulic Truck Crane	350 ton	
Gross Vehicle Weight	158,730 pounds	18.5% Delta
Maximum Counterweights	220,400 pounds	42.8% Delta
Outrigger Status - Extensions	100% 28'6" Spread	61.4% Delta Total
Crane Rotation Status	360 degrees	

		Horizontal Distance - Crane to Tank			*Lift Capacity*	*Percent Loading*	
V-13	East Tank	90.0	h-lineal feet		62,000	53.9%	7 & 6
V-14	West Tank	110.0	h-lineal feet		46,000	72.7%	7 & 6
RUBB THA	26.2' x 65.0'	110.0	h-lineal feet	7,175	46,000	15.6%	
Precast "C" Shape		110.0	h-lineal feet	22,728	46,000	49.4%	

coordinates E 357317, N 795571 and E 357358, N 795604:

a) Perform SPT tests (ASTM D-1586, AASHTO T-206) and retrieve samples at 5 ft intervals to bedrock .
b) Have a PG or PE familiar with ASTM D-1586 and ASTM D-2488 on site during all drilling operations to recover and log samples in accordance with ASTM D-2488.

Lab Sampling Program:

1) Classify samples (6-10 each test depending on on-site geologist recommendations) per:
   a) Atterberg Limits – ASTM D 4318
   b) Particle – Size Analysis – ASTM D 422.
   c) Moisture Content – ASTM D 2216

On-site Geologist: Boe Reynolds, Northwind Environmental, 208-528-8718, x192
Driller: Joe Lambert and Ivan Perkes, Dynatec Drilling
Drill Rig: Foremost DR-24
Sampling Equipment: Hollow stem auger; standard split spoon sampler; automatic (hydraulic) hammer.

Data Reduction

Boe Reynolds provided ITR with raw SPT results and logbooks for the work. Shaun Dustin reduced the raw SPT logs and used the reduced data used the SPT logs to produce the soil characterization. Craig Bean provided soil classifications.

The field and lab data were tabulated (see attached spreadsheet, Appendix B), and standard correlations from Principles of Geotechnical Engineering (Braja M. Das, PWS Publishing, 1994) were applied to develop inputs for the slope stability model.

The crane loads were provided by the Grove Crane Company (Appendix E), assuming a boom load of 30,000 lbs and 97,000 lbs of counterweights on a Grove GMK5240 crane with outriggers fully extended.

The preliminary slope determination was made using the criteria outlined in the CFR. SNAIL, the California Transportation Department model for slope stability analysis was used to verify excavation stability.

4.0 Calculations

Design Basis: CFR 29, Chapter XVII, Section 1926.652

The laboratory data (Appendix C) classifies the material to be excavated as lean clay. The SPT results (Appendix B) indicate a minimum unconfined compressive strength of 4000 lbs/ft^2. Per

CFR 29, this classifies as a Class A soil, and allows a cut slope of 3/4H : 1V. I have made a conservative assumption, however, given that portions of the excavation may intercept the previously disturbed soil that was excavated during the installation of the tanks. CFR-29 requires that previously disturbed Class A soil should be treated as Class B soil, which requires a maximum slope of 1H : 1V.

Design Basis: SNAILZ Model

The SNAILZ software is a package developed by the California Department of Transportation for analysis of slopes. The following excerpt was taken from the CALTRANS website (http://www.dot.ca.gov/hq/InfoSvcs/EngApps/):

> **SNAILZ** is a DOS computer program, which stands for Soil NAIL (the Z differentiates this version from a previous version of this program). This program was developed for use in stability analysis of slopes, which are reinforced with Soil Nail Retaining Walls. The program uses a bi-linear wedge analysis for failure planes existing at toe of walls and tri-linear wedge for failure planes developing below and beyond the wall toe. It is a fully balanced force equilibrium equation with only soil interslice forces included, based on a mobilized angle of internal friction and cohesion. For more information contact Shawn Wei (shawn_wei@dot.ca.gov 916-227-7142) Features of this program are:
>
> - allows up to seven soil layers, multiple slope geometry including allowance for up to two slopes below the wall
> - input of water surface (phreatic or piezometric)
> - nail size and spacing can be varied
> - input of an inclined external force
> - input of up to two surcharges
> - allows earthquake loading
> - can be used for slope stability analysis with or without reinforcement
> - can be used for stability analysis of tie-back walls.

Model Inputs: Input data for the model was derived from the geometric requirements for the work, and the lab and field data contained in Appendices B, C, and D as follows:

Geometric Requirements: 19 feet deep with layout as shown in Appendix A

Surcharge Loads:

1) Check w. 20' high spoils pile, toe of spoils pile 20' from edge of excavation, unit weight of soil = 110 lbs/ft^3, slope of spoils pile =1.5H:1V. The model also assumes a strip load of 3000 psf to account for vehicular traffic between the spoils pile and the excavation.
2) Check with crane surcharge located on 8'x8' timber cribbing centered 22' from edge of excavation as indicated in Appendix D. Point load of 129,000 lbs under the SW outrigger reduces to a distributed load 8 ft long under the cribbing starting 18 feet from the edge of

the excavation.

3) Check with crane surcharge located on 8'x8' timber cribbing centered 14' from edge of the ramp as indicated in Appendix D. Point load of 129,000 lbs under the SW outrigger reduces to a distributed load of 2015 psf 8 ft long under the cribbing starting 9.4 feet from the edge of the excavation. Excavation depth at this point is 14.3 ft

Soil Characteristics (From Appendix B):

- N_{60min}: 16
- Unit weight of soil: 110 pcf
- q_u, unconfined compressive strength: 4000 psf (from Das, Table 14.3)
- c, cohesion: 2000 psf
- Angle of internal friction: 25° (Das, Table 9.3, conservative assumption)
- Water table is below failure plane
- Soil is treated as homogeneous mixture with the uniform characteristics of the weakest identified layer

5.0 Summary of Results

The maximum cut slope for any portion of the embankment is 1:1. Toe of stockpile slopes shall not be located nearer to the top of the excavation than 20 feet. No haul traffic shall be permitted within 10 feet of the edge of the excavation.

Results:

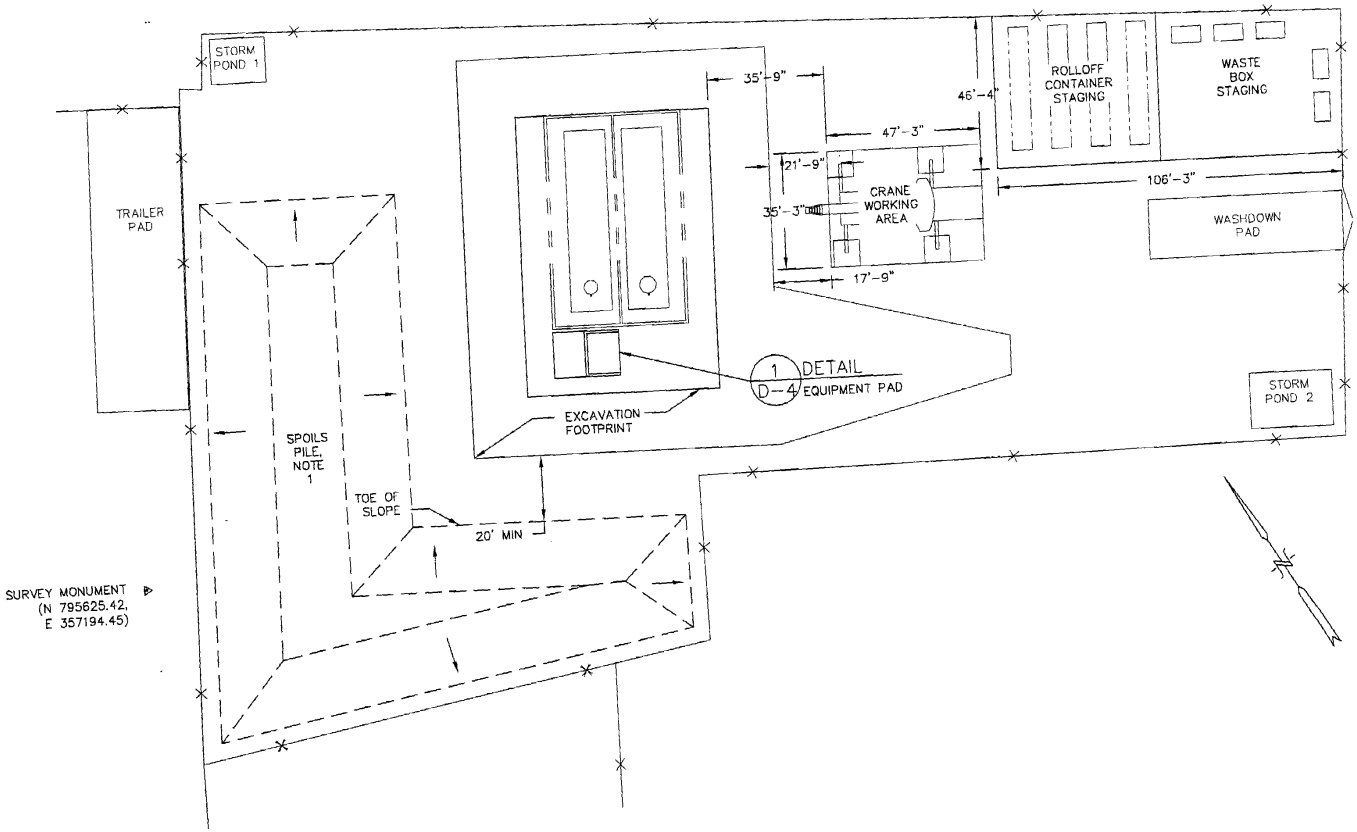
Case 1, Spoils Pile Surcharge: FS=4.17
Case 2, Crane Surcharge, main excavation: FS=5.21
Case 3, Crane Surcharge, ramp: FS=4.68

A factor of safety of 2.5 would be acceptable. In both load cases, the CFR mandated maximum slopes provide adequate factors of safety for the work.

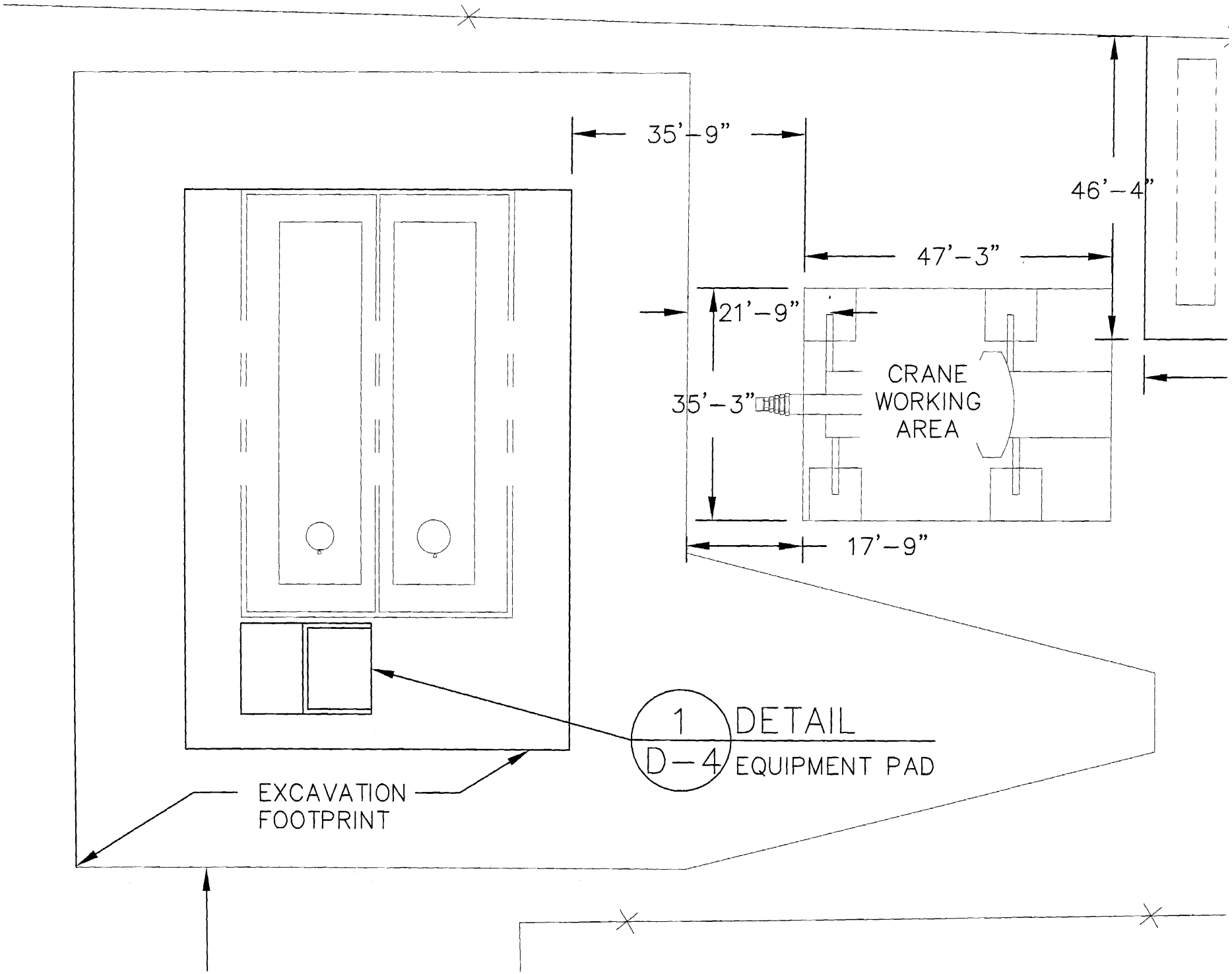
In the event that soils differing from those outlined in this design are encountered, the work should be stopped and the slopes re-evaluated on the basis of the new information.

SNAILZ model output for all cases is included as Appendix F.

Appendix A: Figures



CONSTRUCTION SITE LAYOUT


35'-9"
46'-4"
47'-3"
21'-9"
CRANE
WORKING
AREA
35'-3"
17'-9"
1
D-4
DETAIL
EQUIPMENT PAD
EXCAVATION
FOOTPRINT

NOT LOGGED

SILTY CLAY

SAND

REFUSAL;
CONCRETE
TANK TROUGH

4753.5 + 17 bedding + 6 = 4760.75

IRA 656
SCALE: 1"=2'

SILTY CLAY

REFUSAL;
MOVED 1 FT
SOUTHWEST
TO 655A

IRA 655
SCALE: 1"=2'

SILTY CLAY

SANDY SILT

REFUSAL;
POSSIBLY
TANK WALL.
MOVED 1 FT
WEST TO
655B

IRA 655A
SCALE: 1"=2'

NOT LOGGED

SILTY SAND

SILTY CLAY

SAND

REFUSAL;
CONCRETE
TANK TROUGH

IRA 655B
SCALE: 1"=2'

SILTY SAND

NOT LOGGED

SILTY CLAY

NOT LOGGED

REFUSAL;
BASALT

IRA 658
SCALE: 1"=2'

NOT LOGGED

SILTY SAND

NOT LOGGED

HARD CLAY

NOT LOGGED

REFUSAL;
BASALT

IRA 660
SCALE: 1"=2'

NOT LOGGED

REFUSAL;
BASALT

IRA 657
MOVED TO SW
CORNER OF CRADLE
SCALE: 1"=2'

NOT LOGGED

REFUSAL;
CONCRETE
TANK TROUGH

IRA 619
SCALE: 1"=2'

REV	DATE	DESCRIPTION

NOTES

REFERENCE DRAWIN

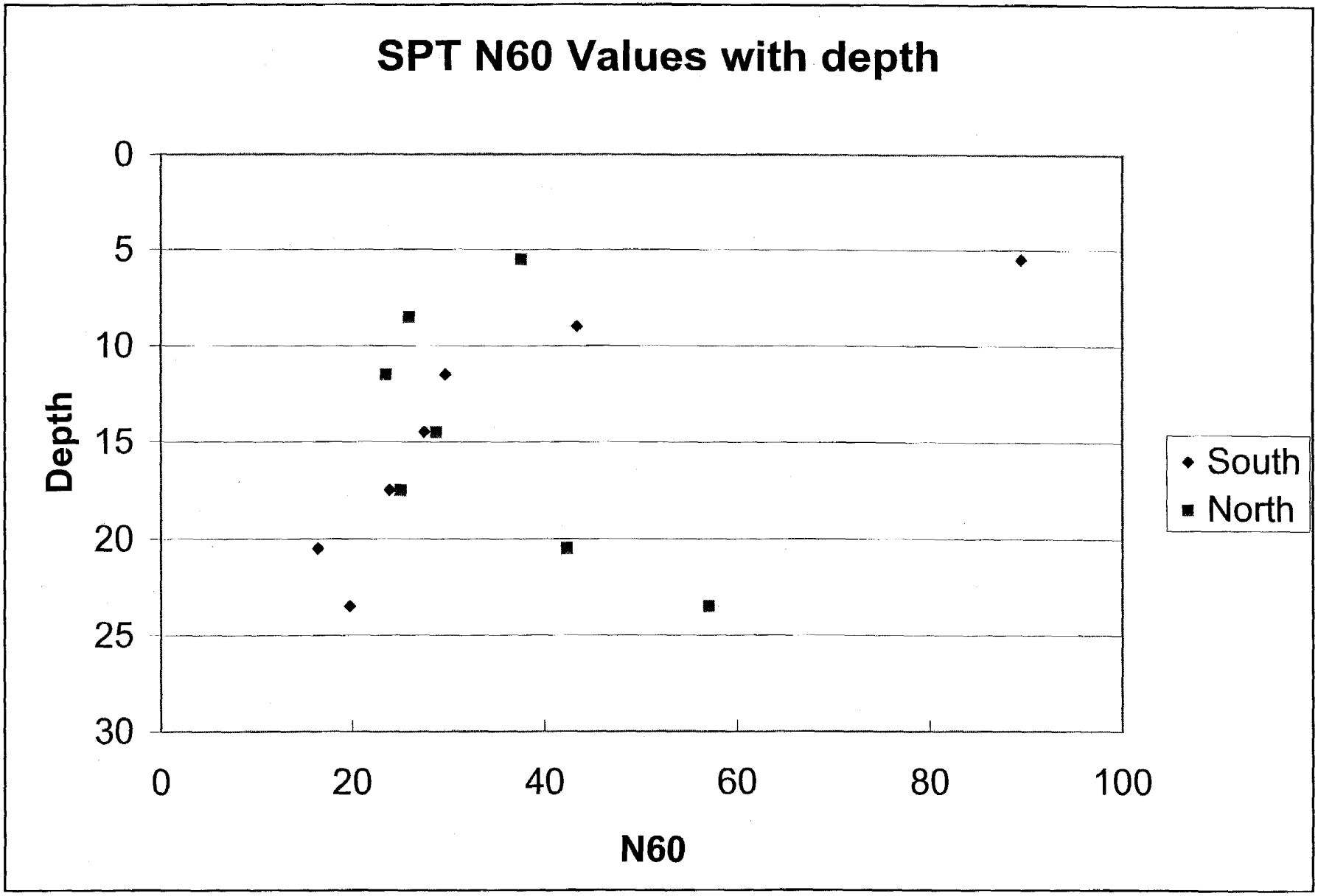
DRAWING NO.	DRAWING TITLE

intrepid technology
incorpo
501 W. BROADWAY, SUITE 200, IDAHO
(208)529-5337 FAX: (208

DRAWN:		TA
DESIGNED:		QA LE
CHECKED:		
APPROVED:		DR
CADD FILE=.DWG		

Appendix B: Field Sampling Data

Date	Borehole	Sample	Interval	Blow counts	raw N-value	Depth of Overburden, h (ft)	γ, unit weight of overburden, assumed (lbs/ft^3)	Effective overburden pressure, $\sigma'=\gamma h/2000$ (tons/ft^2)	Correction Factor, $C_N=(1/\sigma')^{0.5}$	Hammer Efficiency, E_m	Borehole Diameter Factor (6" borehole), C_B	Rod Length Factor, C_R	Corrected N-Value, $N60=(E_M C_B C_R N)/(0.60)$	q_u, unconfined compressive strength, lbs/ft^2 from Das, Table 14.3	cohesion, $c=q_u/2$	Angle of internal friction, degrees (from Das, Fig 9.3, assuming PI=10)	Shear Strength, s, lbs/ft^2
4/14/2003	South	2	3	26	50	5.5	110	0.3025	1.82	0.75	1.05	0.75	89	8000	4000	30	4349
4/14/2003	South	3	3	18	31	9	110	0.495	1.42	0.75	1.05	0.75	43	8000	4000	30	4572
4/14/2003	South	4	3	14	24	11.5	110	0.6325	1.26	0.75	1.05	0.75	30	8000	4000	30	4730
4/14/2003	South	5	3	13	22	14.5	110	0.7975	1.12	0.75	1.05	0.85	27	4000	2000	30	2921
4/14/2003	South	6	3	10	21	17.5	110	0.9625	1.02	0.75	1.05	0.85	24	4000	2000	30	3111
4/14/2003	South	7	3	7	14	20.5	110	1.1275	0.94	0.75	1.05	0.95	16	4000	2000	30	3302
4/14/2003	South	8	3	12	18	23.5	110	1.2925	0.88	0.75	1.05	0.95	20	4000	2000	30	3492
4/14/2003	North	1	3	10	21	5.5	110	0.3025	1.82	0.75	1.05	0.75	38	8000	4000	30	4349
4/14/2003	North	2	3	9	18	8.5	110	0.4675	1.46	0.75	1.05	0.75	26	4000	2000	30	2540
4/14/2003	North	3	3	10	19	11.5	110	0.6325	1.26	0.75	1.05	0.75	24	4000	2000	30	2730
4/14/2003	North	4	3	13	23	14.5	110	0.7975	1.12	0.75	1.05	0.85	29	4000	2000	30	2921
4/14/2003	North	5	3	12	22	17.5	110	0.9625	1.02	0.75	1.05	0.85	25	4000	2000	30	3111
4/14/2003	North	6	3	23	36	20.5	110	1.1275	0.94	0.75	1.05	0.95	42	8000	4000	30	5302
4/14/2003	North	7	3	33	52	23.5	110	1.2925	0.88	0.75	1.05	0.95	57	8000	4000	30	5492


SPT N60 Values with depth
Depth
0
5
10
15
20
25
30
0
20
40
60
80
100
N60
South
North

Shaun Dustin
INTREPID

ENVIRONMENTAL RESTORATION DEPARTMENT

FIELD TEAM LEADER'S DAILY LOGBOOK

DATE START Apr 08 **, 20** 03

DATE END _____ **, 20** _____

LOGBOOK NUMBER: ER-035-2003

LOGBOOK ASSIGNED TO: Roger Mockli

PROJECT: RA Sampling and FS of Grp 1 Sites at WAG 1, OU 1-10

WHEN COMPLETED RETURN TO:

EMMA MCINTOSH
526-4610

OR

COREY HARRIS
526-2850

MS 3960

FIELD TEAM LEADER'S DAILY LOGBOOK

13 May 03 TSF-26 (Intrepid Work)

1300 - L. Lopez(STR) Cunducted pre-job briefing - Scope to complete 2 boreholes for Intrepid. We will be collecting 18" runs every 3 ft as well as counting blows to determine a penetration test.

1335 - We will need more plastic for leap frogging the rig to set up inside TSF-26.

1401 - L. Lopez offsite to get plastic from the lay down area.

Crew: Joe Lambert, Danny Waddoups, Ivan Perkes - Drillers, Boe Reynolds - Geologist, Lori Lopez - STR.

1430 - RAD CON onsite as well as crew. Waiting for plastic tarps.

1645 - Set up to auger / sample @ Borehole south on the berm. Lori Lopez offsite.

1705 - Begin Augering

1707 - Augered to 1.5 ft.

1708 - getting hammer ready.

1730 - offsite Boe D. Reynolds 13 may 03

FIELD TEAM LEADER'S DAILY LOGBOOK

14 May 03 South Borehole

0700 Lori Lopez gives P.O.D, called shaun Dustin and made a plan to drill down to 5 ft, then sample as regular every 3 ft.

0730 Plan of the day is to work to ASTM Standards

0805 Begin augering to 5 ft

0810 End augering / Getting hammer ready

Sample #2	Blow Counts	Time Start	Time Stop	Refusal @
6"	12	0822	0823	
12"	24	0824	0825	
18"	26	0825	0826	-
N-value	50			

% recovery - 100%

moisture Content - Dry - slightly moist

composition - silty Sand & Clay SC-SM

color - greish brown

condition - Good

stratification - uniform.

Refusal depth - None

End depth - 6.5 ft start depth - 5 ft

0830 - pulling sample

0845 - augered to 8 ft to Begin Sample #3

FIELD TEAM LEADER'S DAILY LOGBOOK

Sample #3		Blow Count	Time Start	End	
8-9.5 ft attempt	6"	8	0905 ~~0850~~	0906	
	12"	13	0906	0907	
	18"	18	0907	0907:30	
(N Value)	N-V	31			

% recovery - 100%

Moisture Content - Slightly moist

Composition - Silty Sand & Clay SC-SM

Stratification - Uniform

Refusal depth - None

End depth - 9'11"

Start depth - 8'5"

Note: The hammer wasn't working right so we will start over from 8'5"

0930 Augered to 11 ft, begin to set up for sample

Sample #4		Blow Count	Time Start	End	
	6"	6	0937	0937:30	
	12"	10	0938	0938:30	
N-value - 24	18"	14	0939	0940	½ in. too far

% recovery - 75%

Moisture Content - slightly moist

Stratification - Uniform, silty Sand & Clay

Refusal depth - None

Start depth / End depth - 11 ft / 12.5 ft

0955 - augered to 14 ft.

13 MAY 03 (accidental skip of page)

Sample ~~or Run~~ #1 (13 may 03)

Blow Counts		Start	Stop
6"	16	1622	~~1625~~ BR 5/13/03 1624
12"	31 blows (went 1.5")	1625	1628 (hit refusal)
18"			
N-value	31 blows		

% recovery - 7.5"/7.5" (100%)
Moisture Content - Dry
Composition - Silty Sand & clay
Color - Grayish brown
Condition - contains <5% rusted metal flakes
Stratification - unified
Refusal @ - 7.5"
End depth - 2' 1½"

1700 - RAD CON surveyed all of equipment out.
We are headed to ~~survey rad con out~~ BR 13 may 03
Get off RWP.
1730 - offsite Bre Reynolds 13 may 03

BR 13 may 03

FIELD TEAM LEADER'S DAILY LOGBOOK

14 May 03 continued from page 23

Sample #5	Blow Count	Start Time	Stop
6	5	1004	1004
12	9	1004	1005
18	13	1005	1006
N-Value	22		

% recovery – 90%

moisture content – Slightly moist

composition – fine grained sand 2" Layer of clay at 15".

color – brown to gray

condition – good

stratification – 0-10" – Fine Sand, 10"-15"-clay, 15-18"-FS

Refusal depth – none

start/End depth – 14 ft / 15.5 ft

1030 augered to 17 ft, Broke the wireline and now waiting for crimper & crimps, continue @ 1055

Sample #6	Blow Count	Start Time	Stop
6"	6	1120	1120
12"	11	1121	1121
18"	10	1122	1122
N-Value	21		

% recovery – % 100

Moisture Content – Slightly Moist

Color – light Brown - gg

condition – good

stratification – silty Sand to SC-GM coarse Sand

start/End depth – 17 ft/18.5

FIELD TEAM LEADER'S DAILY LOGBOOK

14 may 03

1140 Sampled #6, augered to 20 ft.

Sample #7	Blow count	Time start	Time stop
6"	10	1143	1144
12"	7	1144	1144
18"	7	1144	1145

% recovery – 100%

Moisture content – moist - slightly moist

composition – 0-12" is medium grained sand, 12-18" silty sand & clay

color – light brownish grey.

condition – good

stratification – 0-12" loose sand, 12-18" silty sand & clay

start / End depth – 20 ft / 21.5 ft.

1320 Inserting split spoon after 30 minute Lunch break.

Sample #8	Blow Count	Time start	Time End
6"	6	1320	–
12"	6	1321	–
18"	12	1326	1327

% recovery – 100% | Moisture content – moist

Composition – see stratigraphy, pebble sized basalt clasts in bottom 2" & 3

color – medium brown & grey | condition – fresh.

Strat – 0-12" is medium fine sand | Start/End depth – 23 / 24.5

12-18" is silt, clay, sand, caliche.

FIELD TEAM LEADER'S DAILY LOGBOOK

14 May 03

1345 - Augered to 25'10" and hit basalt. We will move to the next hole and start again.

1435 - Setting up on Borehole North #2
We will auger to 5 feet then begin sampling sequence.

1450 - drilled to 5 ft, will begin penetration test

Sample # 1	Blow Counts	start	End
6	9	1504	1505
12	11	1505	1506
18	10	1506	1507
N-value	21		

% recovery - 100%
Composition - Mostly silty sand & clay sc-sm w/small coarse grains of caliche
Color - Medium brownish grey
Stratigraphy - Uniform
Moisture Content - Dry - slightly moist
Condition - Solidified & hard (sticky)
Start/End depth - 5/6.5 ft

Note: Bob Sutherlan was onsit from 0830 to 1030 to survey in all holes. It turns out we missed a native soil sample in TSF-26 IRA 554 and a hole in ISF-06 (Pipe access line to 15 ft). No word as to response action from Mark Eliot.

FIELD TEAM LEADER'S DAILY LOGBOOK

14 may 03

1515 augered to 8 ft to begin penetration test.

Sample #2	blow count	start	End
6"	6	1523	1523
12"	9	1524	1524
18"	9	1525	1525
N-value	18		

% recovery - 100%

moisture content - slight to moist

composition - silt & clay [SC]

stratigraphy - uniform

color - medium to dark brown

condition - moderate to high plasticity

start/End depth - 8 ft / 9.5 ft

1535 augered to 11 ft to begin penetration test

Sample #3	Blow Count	start	End
6"	6	1545	1545
12"	9	1546	1547
18"	10	1547	1548
N-value	19		

% recovery - 90%

stratigraphy - uniform low plasticity

condition -

composition - clay & silt w/ a few wood debris

moisture content - dry - slightly moist

color - medium brown

Start/End depth - 11 ft / 12.5 ft

FIELD TEAM LEADER'S DAILY LOGBOOK

14 may 03

1555 augered to 14 ft to begin penetration test

Sample #4	Blow Count	start	End
6	7	1606	1607
12	10	1607	1608
18	13	1608	1609
N-value	23		

% recovery - 100 %

moisture content - somewhat moist

composition - Mostly silty Sand & Clay, some pebble sized clasts

stratigraphy - pebble sized clasts (15%) from 12-14 in ft

color - brownish ~~grey~~ BR 14may

condition - low to moderate plasticity

start/End depth - 14 - 15.5 ft

1620 - augered to 17 ft to begin next sample

Sample #5	Blow Count	start	End
6	8	1625	1626
12	10	1626	1626
18	12	1627	1627
N-value	22		

% recovery - 100

stratigraphy - gravel in bottom

condition - low-Mod Plasticity

composition - silty sand and clay from 0 - 12 inches & 12 inches - 18 inches contains pebble sized clasts moderately rounded sedimentary rocks. Caliche present.

moisture - slightly moist

color - medium Brown

start/End depth - 17 / 18.5 ft

29

FIELD TEAM LEADER'S DAILY LOGBOOK

14 may 03

1635 – shutting down for the day & surveying samples out.

1645 – Getting off RWP

1730 – offsite Barb D. Ryplah

14 may 03

FIELD TEAM LEADER'S DAILY LOGBOOK

15 may 03

0700 L. Lopez gives POD. Crew is same as yesterday. Joe Lambert drilling, Ivan Perkes helping. Bob Reynolds Geologist/FTL.

0730 All personel is onsite for work to finish ground penetration. RWP is in check. We are on North Borehole #2.

0805 augered down to 20 ft

Sample #6	Blow Count	start	End
6"	7	0812	0812
12"	13	0813	0813
18"	23	0814	0815
N-Value	36		

% recovery - 75%

moisture content - moist

Composition - 0-6" was fine-med grained sand, 6-18" is silty clay

stratigraphy - change from sand to clay @ 6".

color - Brown (dark) to Medium grey

condition - high plasticity in clay, low in sand.

start / End depth - 20 / 21.5 ft

0835 augered to 23 ft to begin penetration test

BR 15 may 03

FIELD TEAM LEADER'S DAILY LOGBOOK

15 may 03

Sample #7 15 may 03	Blow Count	Start	End
6"	11	0847	0848
12"	19	0848	0849
18"	33	0849	0850
N-Value	52		

% recovery - 75%

Moisture content - moist

composition - 0-6" & 12-18" are SC, 6-12" is fine sand. Basalt pebbles at 24 ft

color - dark Brown

condition - High Plasticity in silt&clay, sand is loose

Stratigraphy - sand from 23.5 to 24 ft

start/End depth - 23/24.5 ft

0915 augered to basalt @ 24.6 ft.

1115 Jon Ely (RTC) is checking smears after working to survey the rig out of the zone.

1200 All personel is off RWP and breaking for Lunch.

1230 Drillers have gotten everything out of the zone. They will clean up around the site and leave.

Note: WGS is taking care of RAD waste as well as cold waist.

Intrepid (North #2 Bore Hole):									
Sample/ Interval	Date	Interval (in)	Blow Counts	Material	Recovery (%)	Moisture	Start	Stop	Comments:
1	14-May-03	0-6	9	Silty sand & clay (SC-SM)	100	Dry	1504	1505	
5' - 6.5'		6-12	11	Silty sand & clay (SC-SM)	100	Slightly moist	1505	1506	
		12-18	10	Silty sand & clay (SC-SM)	100	Slightly moist	1506	1507	
		n-value	21						
2	14-May-03	0-6	6	Silty sand & clay (SC)	100	Dry	1523	1523	
8' - 9.5'		6-12	9	Silty sand & clay (SC)	100	Slightly moist	1524	1524	
		12-18	9	Silty sand & clay (SC)	100	Slightly moist	1525	1525	
		n-value	18						
3	14-May-03	0-6	6	Silty sand, clay & wood debris	90	Dry	1545	1545	
11' - 10.5'		6-12	9	Silty sand, clay & wood debris	90	Slightly moist	1546	1547	
		12-18	10	Silty sand, clay & wood debris	90	Slightly moist	1547	1548	
		n-value	19						
4	14-May-03	0-6	7	Silty sand, clay & some pebbles	100	Dry	1606	1607	
14' - 15.5'		6-12	10	Silty sand, clay & some pebbles	100	Slightly moist	1607	1608	
		12-18	13	Silty sand, clay & some pebbles	100	Slightly moist	1608	1609	
		n-value	23						
5	14-May-03	0-6	8	Silty sand & clay (SC)	100	Dry	1625	1626	
17' - 18.5'		6-12	10	Silty sand & clay (SC)	100	Slightly moist	1626	1626	
		12-18	12	Silty sand, clay & some pebbles	100	Slightly moist	1627	1627	
		n-value	22						
6	15-May-03	0-6	7	Sand, fiine-grained	75	Dry	0812	0812	
20' - 21.5'		6-12	13	Silty sand & clay (SC)	75	Slightly moist	0813	0813	
		12-18	23	Silty sand & clay (SC)	75	Slightly moist	0814	0814	
		n-value	36						
7	15-May-03	0-6	11	Silty sand & clay (SC)	75	Dry	0847	0848	
23' - 24.5'		6-12	19	Sand, fiine-grained	75	Slightly moist	0848	0849	
		12-18	33	Silty sand, clay & some pebbles	75	Slightly moist	0849	0850	
		n-value	52						

Intrepid (South Bore Hole):									
Sample/ Interval	Date	Interval (in)	Blow Counts	Material	Recovery (%)	Moisture	Start	Stop	Comments:
1	13-May-03	0-6	16	Silty sand & clay (SC)	100	Dry	1622	1624	
1.5' - 2' 1.5"		6-12	31	Silty sand & clay (SC)	100	Dry	1625	1628	Refusal at 7.5 in.
		12-18							
		n-value	31						
2	14-May-03	0-6	12	Silty sand & clay (SC-SM)	100	Dry	0822	0823	
5 - 6.5'		6-12	24	Silty sand & clay (SC-SM)	100	Slightly moist	0824	0825	
		12-18	26	Silty sand & clay (SC-SM)	100	Slightly moist	0825	0826	
		n-value	50						
3	14-May-03	0-6	8	Silty sand & clay (SC-SM)	100	Dry	0905	0906	
8.5 - 9' 11"		6-12	13	Silty sand & clay (SC-SM)	100	Slightly moist	0906	0907	
		12-18	18	Silty sand & clay (SC-SM)	100	Slightly moist	0907	0908	
		n-value	31						
4	14-May-03	0-6	6	Silty sand & clay (SC-SM)	75	Dry	0937	0938	
11 - 12.5'		6-12	10	Silty sand & clay (SC-SM)	75	Slightly moist	0938	0939	
		12-18	14	Silty sand & clay (SC-SM)	75	Slightly moist	0939	0940	
		n-value	24						
5	14-May-03	0-6	5	Sand, fine-grained	90	Dry	1004	1004	
14 - 15.5'		6-12	9	Sand, fine-grained	90	Slightly moist	1004	1005	
		12-18	13	Sand, fine-grained	90	Slightly moist	1005	1006	
		n-value	22						
6	14-May-03	0-6	6	Silty sand to coarse gravel (SC-GM)	100	Dry	1120	1120	
17 - 18.5'		6-12	11	Silty sand to coarse gravel (SC-GM)	100	Slightly moist	1121	1121	
		12-18	10	Silty sand to coarse gravel (SC-GM)	100	Slightly moist	1122	1122	
		n-value	21						
7	14-May-03	0-6	10	Sand, medium-grained	100	Dry	1143	1144	
20 - 21.5'		6-12	7	Sand, medium-grained	100	Slightly moist	1144	1144	
		12-18	7	Silty sand & clay (SC-SM)	100	Slightly moist	1144	1145	
		n-value	14						

Intrepid (South Bore Hole):									
Sample/ Interval	Date	Interval (in)	Blow Counts	Material	Recovery (%)	Moisture	Start	Stop	Comments:
8	14-May-03	0-6	6	Sand, fine and medium-grained	100	Dry	1320	1320	
23 - 24.5'		6-12	6	Sand, fine and medium-grained	100	Slightly moist	1321	1321	
		12-18	12	Silt, sand, clay and caliche	100	Slightly moist	1326	1327	
		n-value	18						

Appendix C: Lab Data

Idaho National Engineering and Environmental Laboratory

ORIGINAL

INEEL
Home of Science and Engineering Solutions

INTEROFFICE MEMORANDUM

Date: June 11, 2003

To:	Kathleen A. Otter	MS 3960	6-5405
From:	H. Craig Bean	MS 4136	6-9941

Subject: LETTER OF TRANSMITTAL

This letter is to document the transmittal of the soil testing data and final report in support of the testing conducted by the INEEL Materials Test Lab on soil samples from the TAN/TSF (06-26) Group 1 soil characterization. The testing was conducted in accordance with ER-SOW-434.

HCB:snh

Enclosures

cc: H. Craig Bean Letter File

RECEIVED
JUN 11 2003

UNQUALIFIED/UNVALIDATED DATA

Uniform File Code: 7101
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Retention Schedule: Destroy when 10 years old.

NOTE: Original disposition authority, retention schedule, and Uniform Filing Code applied by the sender may not be appropriate for all recipients. Make adjustments as needed.

435.20
05/16/2000
Rev. 01

INEEL SAMPLE MANAGEMENT OFFICE
CHAIN OF CUSTODY FORM

6/18

15780

See Instructions On Back

Page _____ of _____

[1] Sampler (Printed):	[2] Sampler (Signature):	[3] Project Name: Group 1 (BF-06, TSF-26 Soils - Physical Properties
Lori Lopez		[5] Sampling & Analysis Plan Number: DOE/ID - 10725
[4] Laboratory Shipped To: INEEL materials testing Lab		[6] TOS/SOW/PSR Number: ER-SOW-434

[7] Sample ID#	[8] Sample Date	[9] Sample Time	[10] Sample location	[11] Depth	[12] Sample Matrix	[13] Analysis Type No(s)	[14] Preservative	[15] Remarks
IRA17601PR	14 May 03		South Borehole #1 #1	18"-3'	Soil	Physical Properties	None	LL032
IRA17602PR			#2	5-6.5 ft				LL033
IRA17603PR			#3	8.5-9 ft				correction: Depth is 8.5 to 9 ft LL026
IRA17604PR			#4	11-12.5 ft				LL027
IRA17605PR			#5	14-16.5 ft				correction: Depth is 14-15.5 ft LL028
IRA17606PR			#6	17-18.5 ft				LL029
IRA17607PR			#7	20-21.5 ft				LL030
IRA17608PR			#8	23-24.5 ft				LL031

15 May 03

[16] Comments:

Cooler Number(s):

[17] Relinquished By (Printed)	[18] Relinquished By (Signature)	[19] Date	[20] Time	[21] Received By (Printed)	[22] Received By (Signature)	[23] Date	[24] Time
Boe Reynolds		5-15-03	2:15	NeBean		5-15-03	2:15

Distribution: Original & Yellow: Accompany Shipment To Laboratory Pink: Forward To Sample Management Green: Retained By Project

435.20
05/16/2000
Rev. 01

INEEL SAMPLE MANAGEMENT OFFICE
CHAIN OF CUSTODY FORM

6/18

15782

See Instructions On Back

[1] Sampler (Printed): Lori Lopez

[2] Sampler (Signature):

[3] Project Name: Group 1 TSF-06, TSF-26 Soils - Physical Properties

[4] Laboratory Shipped To: INEL Material Testing Lab

[5] Sampling & Analysis Plan Number: DOE/ID-10725

[6] TOS/SOW/PSR Number: ER-SOW-434

[7] Sample ID#	[8] Sample Date	[9] Sample Time	[10] Sample Location	[11] Depth	[12] Sample Matrix	[13] Analysis Type No(s)	[14] Preservative	[15] Remarks
IRA17701PR	14 May 03		Borehole Mark #1	5-6.5 ft	Soil	Physical Properties	None	Lab Log 019
IRA17702PR			#2	8-9.5 ft				020
IRA17703PR			#3	11-12.5 ft				021
IRA17704PR			#4	14-15.5 ft				022
IRA17705PR	↓		#5	17-18.5 ft				023
IRA17706PR	15 May 03		#6	20-21.5 ft				024
IRA17707PR	↓		#7	23-24.5 ft	↓	↓	↓	Lab Log 025

LL 15 May 03

[16] Comments:

Cooler Number(s):

[17] Relinquished By (Printed)	[18] Relinquished By (Signature)	[19] Date	[20] Time	[21] Received By (Printed)	[22] Received By (Signature)	[23] Date	[24] Time
Bo Reynolds		5/15/03	2:15	H C BEAN		5-15-03	2415

Distribution: Original & Yellow: Accompany Shipment To Laboratory Pink: Forward To Sample Management Green: Retained By Project

MATERIALS TEST LAB M&TE LOG

MONTH OF: **Jun-03**

Test Equipment	Equip. ID #	Lab Log #	Cal. Due Date	Project	Remarks
1" sieve	720250		6/6/04		
3/4" sieve	720249		6/6/04		
1/2" sieve	720248		6/6/04		
3/8" sieve	720247		6/6/04		
1/4" sieve	720246		6/6/04		
# 4 sieve	720245		6/6/04		
# 8 sieve	720244		6/6/04		
# 10 sieve	720243	Lab Log #019 thru 033	6/6/04	TAN/TSF 06-26	
# 16 sieve	720242		6/6/04		
# 30 sieve	720241		6/6/04		
# 40 sieve	720237		6/6/04		
# 50 sieve	720236		6/6/04		
# 100 sieve	720235		6/6/04		
# 200 sieve	720234		6/6/04		
#200 deep sieve	720233		6/6/04		
#200 deep sieve	720232		6/6/04		
3" sieve (tray)	703751		12/9/03		
2" sieve (tray)	703754		12/9/03		
1" sieve (tray)	703750		12/9/03		
3/4" sieve (tray)	703752		12/9/03		
1/2" sieve (tray)	703755		12/9/03		
3/8" sieve (tray)	703749		12/9/03		
#4 sieve (tray)	703753		12/17/03		
# 8 sieve (tray)	706667		12/17/03		

1" sieve	703454		12/17/03	
3/4" sieve	703456	Lab Log #019 thru 033	12/17/03	TAN/TSF 06-26
1/2" sieve	703457	Lab Log #019 thru 033	12/17/03	TAN/TSF 06-26
3/8" sieve	703455	Lab Log #019 thru 033	12/17/03	TAN/TSF 06-26
# 4 sieve	703279	Lab Log #019 thru 033	2/3/04	TAN/TSF 06-26
# 8 sieve	703361	Lab Log #019 thru 033	2/3/04	TAN/TSF 06-26
# 10 sieve	703362	Lab Log #019 thru 033	12/17/03	TAN/TSF 06-26
# 16 sieve	703363	Lab Log #019 thru 033	2/3/04	TAN/TSF 06-26
# 30 sieve	703364	Lab Log #019 thru 033	2/3/04	TAN/TSF 06-26
# 40 sieve	703365	Lab Log #019 thru 033	12/17/03	TAN/TSF 06-26
# 50 sieve	703366	Lab Log #019 thru 033	2/3/04	TAN/TSF 06-26
# 100 sieve	703367	Lab Log #019 thru 033	2/3/04	TAN/TSF 06-26
# 200 sieve	703368	Lab Log #019 thru 033	2/3/04	TAN/TSF 06-26
# 200 deep sieve	706530	Lab Log #019 thru 033	12/17/03	TAN/TSF 06-26
# 100 sieve (new)	703360		12/17/03	
# 200 sieve (new)	703359		12/17/03	

Elec. Balance	720633	Lab Log #019 thru 033	8/13/03	TAN/TSF 06-26
Elec. Balance	719957	Lab Log #019 thru 033	10/22/03	TAN/TSF 06-26
Elec. Balance	719914		10/23/03	
Elec. Balance	707776		5/27/04	
Mech. Scale	707777		6/27/03	
Mech. Scale	720632		8/13/03	
Beam Balance	706705		12/18/03	
Beam Balance	705678		12/18/03	
Beam Balance	705075		5/22/04	
Beam Balance	705072		8/1/03	
Beam Balance	702162		5/15/03	

Vernier Caliper	720445		6/12/03	
Vernier Caliper	703266		6/17/04	
Dial Caliper	720312		11/4/03	
Digital Caliper	720325		11/13/03	
PI Tape	715496		8/29/03	
PI Tape	715497		8/29/03	
Micrometer 5-6"	709729		8/8/03	
Depth Micro.	705071		1/28/04	
Micrometer 0-1"	704875		6/28/04	
Height Gage	703268		5/7/04	
Straight Edge	703267		6/12/03	
Multimeter	715154		1/30/04	
Level	705073		10/16/03	
Dial Gage	720744		3/12/03	
Dial Gage	711839		6/17/04	
Dial Gage	711769		3/5/04	
Dial Gage	711699		3/5/04	
Dial Gage	711698		3/5/04	
Dial Gage	711697		6/18/03	
Dial Gage	703747		3/5/04	
Dial Gage	703748		3/5/04	
Glass Therm.	720012		11/1/03	
Glass Therm.	720011		11/1/03	
Glass Therm.	720010		11/1/03	
Glass Therm.	720009		11/1/03	
Glass Therm.	720008	Lab Log #019 thru 033	11/1/03	TAN/TSF 06-26
Dial Therm.	712471		5/30/04	
Dial Therm.	705115		12/8/03	
Dial Therm.	712453		9/26/04	
Dial Therm.	712452		5/30/04	
Dial Therm.	720775		9/26/03	
Dial Therm.	710183		5/25/03	
Recording Therm.	703959		9/30/03	
Digital Therm.	720513		8/27/03	

Tinius-Olsen	267216		6/2/04	
Extensometer	710474		11/19/03	
Capping Plate	703356		8/31/03	
Capping Plate	703231		5/10/03	
Capping Plate	717092		11/10/03	
Slump Cone	710738		5/15/05	
Slump Cone	721033		3/18/04	
Slump Cone	721169		4/'4/05	Plastic Slump Cone
Slump Cone	721034		3/18/04	
Slump Cone	708984		4/14/05	
Air M gages	717090		2/3/04	
Air M gages	717091		2/3/04	
Air M gages	712545		2/3/04	
Air M gages	712544		11/1/04	
Air M gages	712473		2/3/04	

				TAN/TSF
Soil Oven	707768	Lab Log #019 thru 033	1/19/04	06-26
Blue M Oven	224480		11/6/03	
Proving Ring	703230		1/1/04	
Proving Ring	703745		6/10/03	
Proving Ring	711700		6/10/03	
U.W. Container	703286		8/26/03	
Troxler Gage	18792		4/16/04	
Troxler Gage	18793		4/16/04	
Troxler Gage	14088		4/17/04	
Troxler Gage	14089		4/17/04	

INEEL MATERIALS LAB TEST REPORT ON THE ANALYSIS OF COLLECTED SAMPLES FROM THE GROUP 1 (TSF-06 AND TSF-26) SOILS

1. INTRODUCTION

This report defines the tests that were requested and conducted on the Group 1 soil samples delivered to the INEEL Materials Test Lab on May 15th, 2003. This testing was conducted under an ER scope of work (ER-SOW-434).

2. TESTING REQUIREMENTS

The testing requirements for these Group 1 soil samples had been identified in Table 1 of the SOW-434. Fifteen (15) soil samples were delivered by Boe Reynolds on a Chain of Custody (form #435.20). The chain of custody forms indicated the following:

- Sample ID#
- Sample Date
- Sample Location
- Depth of Sample
- Type of Sample
- Analysis Type
- Remarks

All 15 of the soil samples were to be tested for physical properties including:

- Atterberg Limits: ASTM D4318, D423, D424
- Particle Size: ASTM D1140, D1557, D422
- Moisture Content: ASTM D2216

3. TEST REPORT

Samples were tested at the INEEL Materials Lab, located at CFA 602. The soils represent typical TAN area soils. These soils are, for the most part, old lake bed clay soils intermixed with sand and fine gravel layers. The soils at TAN are typically classified as lean clay soils to the Unified Soil Classification System (USCS). The Following tables indicate a summary of the individual test report forms and test results obtained on each sample. The Materials Test Lab made every effort to assure that the samples tested were representative of the samples as delivered. Test results are calculated using GeoSystem software from VES, Inc., Fort Collins, CO. The following tables

are a summary of the various soil results and corresponding test hole locations.

Table 1: Classifications, Liquid Limits, Plastic Limits and Plasticity Index

Sample ID#	Lab Log #	Bore Hole #	Depth	AASHTO Class.	USCS Class.	PL	LL	PI
1RA17601PR	32	#1 South	1.5'-3.0'	A-6(12)	CL	31.6	16.0	15.6
1RA17602PR	33	#2 South	5.0'-6.5'	A-6(13)	CL	31.9	16.1	15.8
1RA17603PR	26	#3 South	8.5'-9.92'	A-6(13)	CL	33.4	17.0	16.4
1RA17604PR	27	#4 South	11.0'-12.5'	A-6(5)	CL	25.1	14.1	11.0
1RA17605PR	28	#5 South	14.0'-15.5'	A-4(3)	CL	23.4	14.3	9.1
1RA17606PR	29	#6 South	17.0'-18.5'	A-4(1)	SC	21.9	13.8	8.1
1RA17607PR	30	#7 South	20.0'-21.5'	A-6(5)	CL	26.7	14.2	12.5
1RA17608PR	31	#8 South	23.0'-24.5'	A-6(6)	CL	28.9	15.6	133
1RA17701PR	19	#1 North	5.0'-6.5'	A-6(11)	CL	30.9	14.6	16.3
1RA17702PR	20	#2 North	8.0'-9.5'	A-6(10)	CL	30.0	16.3	13.7
1RA17703PR	21	#3 North	11.0'-12.5'	A-6(11)	CL	31.1	15.6	15.5
1RA17704PR	22	#4 North	14.0'-15.5'	A-6(14)	CL	35.7	14.8	20.9
1RA17705PR	23	#5 North	17.0'-18.5'	A-6(9)	CL	32.7	14.7	18.0
1RA17706PR	24	#6 North	20.0'-21.5'	A-7-6(21)	CL	45.2	17.9	27.3
1RA17707PR	25	#7 North	23.0'-24.5'	A-6(10)	CL	34.9	14.0	20.9

Notes:
1- AASHTO Classification is to AASHTO Standard M-145, Classification of soils and soil-aggregate mixtures.
2- PL – Plastic Limit, LL – Liquid Limit, PI – Plasticity Index.
3- USCS, Unified Soils Classification System

Table 2: Percent Gravel, Sand, Silt, Clay and Moisture Content

Sample ID#	Lab Log #	Bore Hole #	Depth	% Gravel	% Sand	% Silt	% Clay	% Moist.
1RA17601PR	32	#1 South	1.5'-3.0'	0	13.6	36.3	50.0	10.1
1RA17602PR	33	#2 South	5.0'-6.5'	0	12.0	28.7	59.3	12.9
1RA17603PR	26	#3 South	8.5'-9.92'	0	11.8	35.4	52.8	17.8
1RA17604PR	27	#4 South	11.0'-12.5'	0	32.6	21.4	46.0	14.9
1RA17605PR	28	#5 South	14.0'-15.5'	1.6	32.6	27.6	38.2	16.8
1RA17606PR	29	#6	17.0'-18.5'	1.9	50.4	14.6	33.1	12.3
1RA17607PR	30	Sou#7th	20.0'-21.5'	0	40.4	15.1	44.5	18.3
		South						
1RA17608PR	31	#8 South	23.0'-24.5'	1.4	33.2	27.8	37.6	20.5
1RA17701PR	19	#1 North	5.0'-6.5'	0	20.7	29.7	49.6	14.9
1RA17702PR	20	#2 North	8.0'-9.5'	0	19.1	25.9	55.0	15.0
1RA17703PR	21	#3 North	11.0'-12.5'	0	16.7	29.5	53.8	14.6
1RA17704PR	22	#4 North	14.0'-15.5'	3.2	22.2	22.1	52.5	19.6
1RA17705PR	23	#5 North	17.0'-18.5'	4.5	29.1	20.4	46.0	16.1
1RA17706PR	24	#6 North	20.0'-21.5'	0	20.9	13.6	65.5	19.8
1RA17707PR	25	#7 North	23.0'-24.5'	4.0	34.9	20.3	40.8	17.3

Notes:
1- Gravel defined as particles retained on #4 sieve.
2- Sand defined as particles passing #4 sieve and retained on #200 sieve
3- Silt defined as particles passing #200 sieve and larger than .005 mm
4- Clay defined as particles smaller than .005 mm
5- Percent moisture reported is total sample moisture

There were no soil sample anomalies found or observed during the testing of these samples. As in indicated on the individual test sheets and summary

tables, there is a fairly wide range of moisture contents and plasticity indices. This wide range of results can be typical of naturally deposited soils by water and/or wind. Some of the samples contained small, fine gravel pieces. One sample out of the fifteen tested classified as "clayey sand", rather than the typical "lean clay" designation of the other fourteen samples.

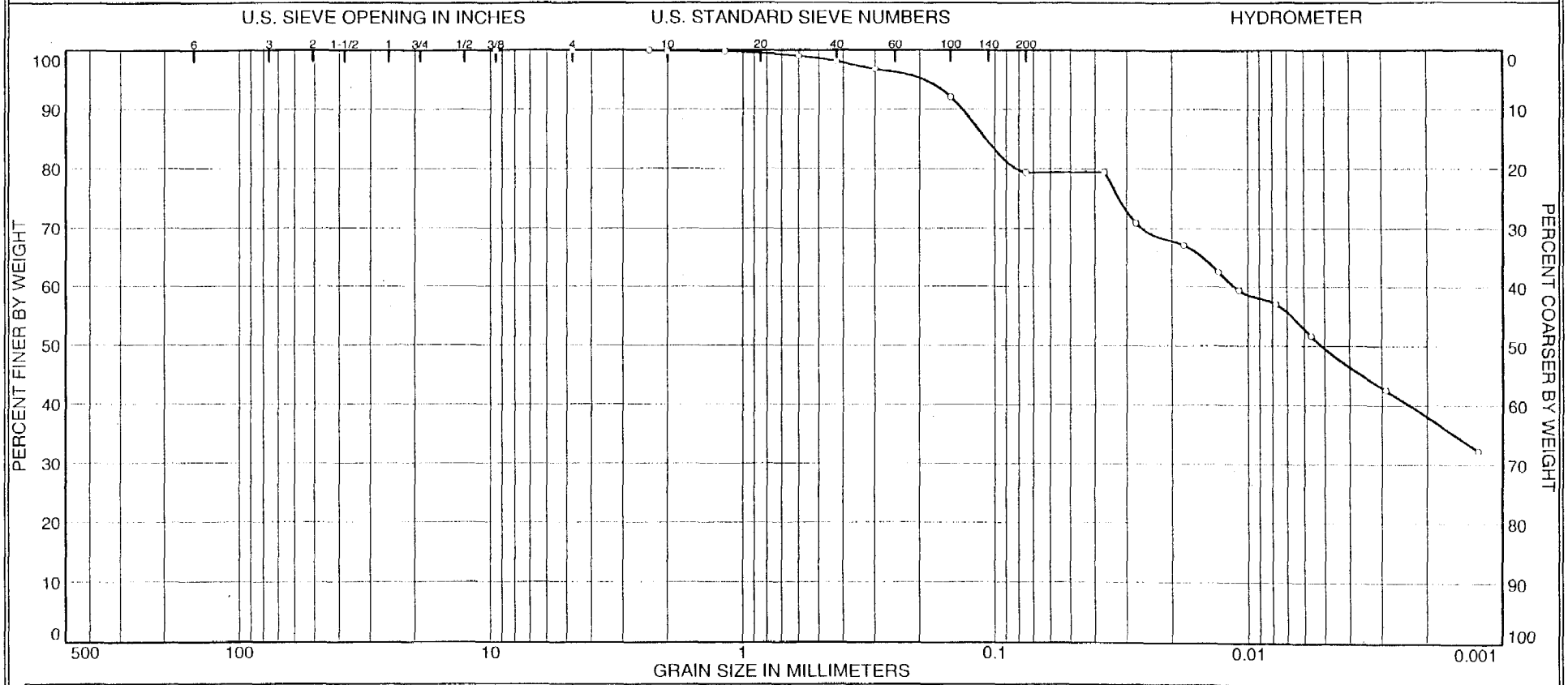
4. SUMMARY

The field data collected during the drilling and sampling of these boreholes is not included in this report, as they were not transmitted with the soil samples. It would be a suggestion of this Lab that the field investigation data be compared and evaluated with these Lab results to further verify any engineering or geo-technical requirements that may be needed. All soil samples tested at the CFA 602 Materials Lab were disposed of in our "cold waste" dumpster at the CFA Landfill. This dumpster at CFA 602 is specifically for the disposal of soils and concrete samples.

Any questions or comments on this test report summary may be directed to Craig Bean, INEEL Materials Lab, CFA 602. Phone number 526-9941.

HC Bean
CFA 602
10 June 2003

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL		% SAND			% FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	0.0	0.2	1.7	18.8	29.7	49.6

	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PL
○	D&D TSF 06-26 soils		5' - 6.5'	6/9/03	CL	Lean clay with sand	14.9%	30.9	14.6

Client

Project

Project No. | Plate

INEEL MATERIALS LAB

○ Sample #IRA17701PR sampled May14th, 2003. Borehole #1 North.

Lab Log #019

GRAIN SIZE DISTRIBUTION TEST DATA

Client:
Project:
Project Number:

Sample Data

Source: D&D TSF 06-26 soils
Sample No.: 1RA17701PR
Elev. or Depth: 5' - 6.5' **Sample Length (in./cm.):** LL #019
Location:
Description: Lean clay with sand
Date: 6/9/03 **Natural Moisture:** 14.9%
Liquid Limit: 30.9 **Plastic Limit:** 14.6 **USCS Class.:** CL
Testing Remarks: Sample #1RA17701PR sampled May14th, 2003. Borehole #1 North.

Lab Log #019

Mechanical Analysis Data

	Initial
Dry sample and tare=	402.44
Tare =	105.79
Dry sample weight =	296.65

Sieve tare method

Sieve	Weight retained	Sieve tare	Percent finer
3/8 inch	0.00	0.00	100.0
# 4	0.00	0.00	100.0
# 8	0.00	0.00	100.0
# 10	0.47	0.00	99.8
# 16	0.24	0.00	99.8
# 30	2.34	0.00	99.0
# 40	2.66	0.00	98.1
# 50	3.87	0.00	96.8
# 100	14.06	0.00	92.0
# 200	37.81	0.00	79.3

Hydrometer Analysis Data

Separation sieve is #10
Percent -#10 based upon complete sample= 99.8
Weight of hydrometer sample: 68.17
Hygroscopic moisture correction:
  Moist weight & tare = 405.64
  Dry weight & tare = 402.44
  Tare = 105.79
  Hygroscopic moisture= 1.1 %
Calculated biased weight= 67.58
Automatic temperature correction
  Composite correction at 20 deg C = -4.0

Meniscus correction only= 1.0
Specific gravity of solids= 2.50
Specific gravity correction factor= 1.038
Hydrometer type: 152H
  Effective depth L= 16.294964 - 0.164 x Rm

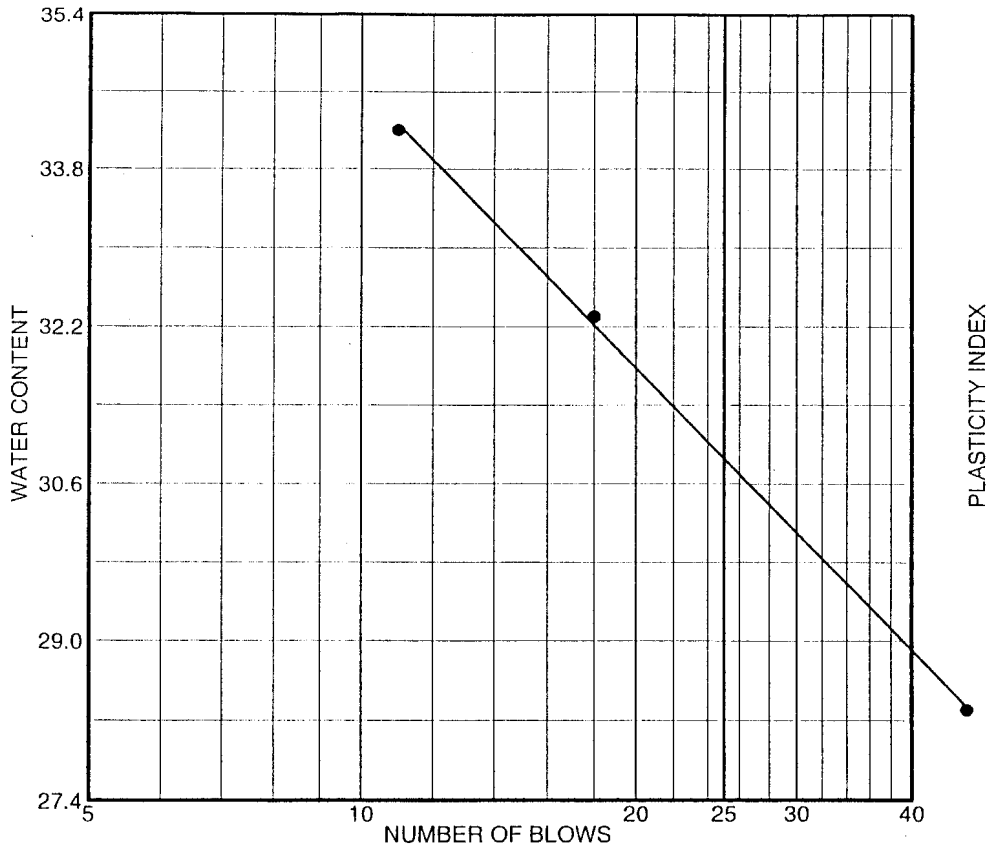
Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
1.00	23.0	55.0	51.7	0.0138	56.0	7.1	0.0368	79.4
2.00	23.0	49.5	46.2	0.0138	50.5	8.0	0.0276	70.9
5.00	23.0	47.0	43.7	0.0138	48.0	8.4	0.0179	67.1
10.00	23.0	44.0	40.7	0.0138	45.0	8.9	0.0130	62.5
15.00	23.0	42.0	38.7	0.0138	43.0	9.2	0.0108	59.4
30.00	23.0	40.5	37.2	0.0138	41.5	9.5	0.0078	57.1
60.00	23.0	37.0	33.7	0.0138	38.0	10.1	0.0056	51.7
250.00	23.0	31.0	27.7	0.0138	32.0	11.0	0.0029	42.5
1440.00	24.0	24.0	21.0	0.0136	25.0	12.2	0.0013	32.2

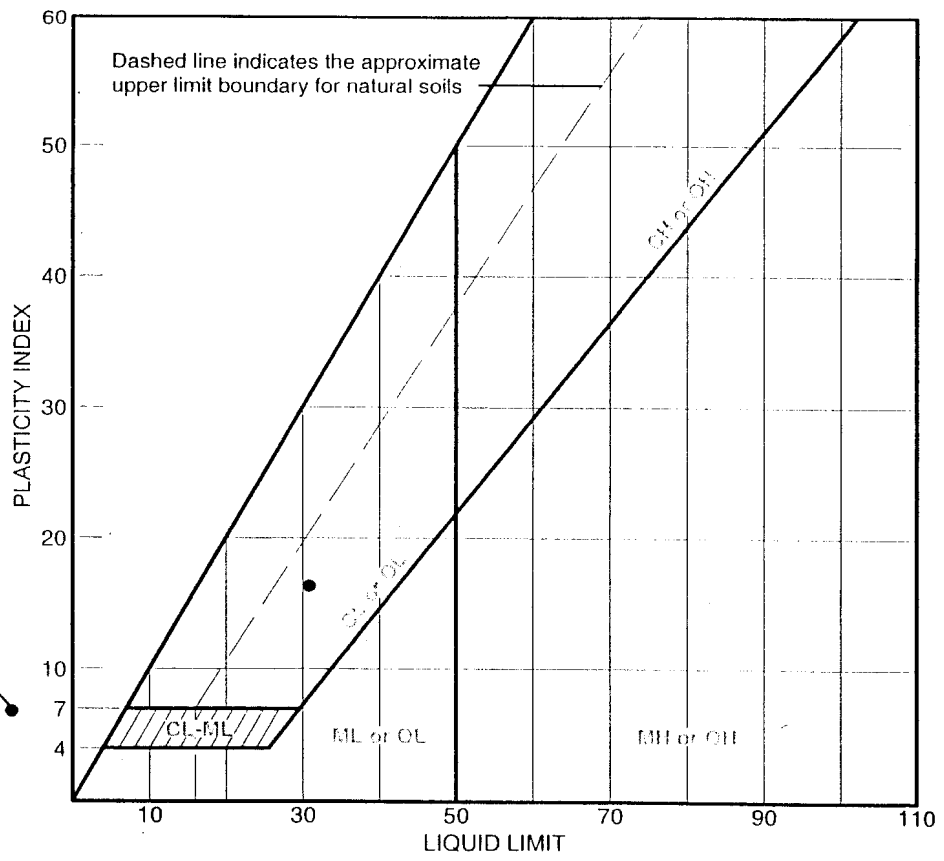
Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% + 3" = % GRAVEL =
% SAND = 20.7 (% coarse = 0.2 % medium = 1.7 % fine = 18.8)
% SILT = 29.7 % CLAY = 49.6

D_{85}= 0.11 D_{60}= 0.01 D_{50}= 0.01

LIQUID AND PLASTIC LIMITS TEST REPORT





	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PI
●	D&D TSF 06-26 soils		5' - 6.5'	6/9/03	CL	Lean clay with sand	14.9%	30.9	16.3

Client

Project

Project No. | Plate

INEEL MATERIALS LAB

● Sample # IRA17701PR Sampled May 14th, 2003. Borehole #1 North.

Lab Log #019

LIQUID AND PLASTIC LIMIT TEST DATA

Client:
Project:
Project Number:

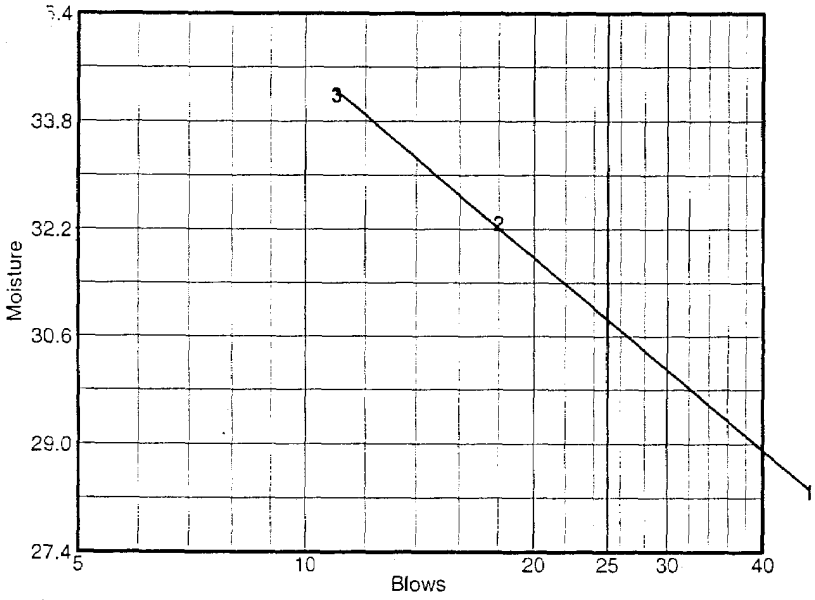
Sample Data

Source: D&D TSF 06-26 soils
Sample No.: 1RA17701PR
Elev. or Depth: 5′ - 6.5′ **Sample Length (in./cm.):** LL #019
Location:
Description: Lean clay with sand
Date: 6/9/03 **Natural Moisture:** 14.9%
USCS Class.: CL **AASHTO Class.:** A-6(11)
Testing Remarks: Sample # 1RA17701PR Sampled May 14th, 2003. Borehole #1 North.

Lab Log #019

Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare	23.40	22.85	23.06			
Dry+Tare	20.68	19.97	20.02			
Tare	11.07	11.06	11.13			
# Blows	46	18	11			
Moisture	28.3	32.3	34.2			

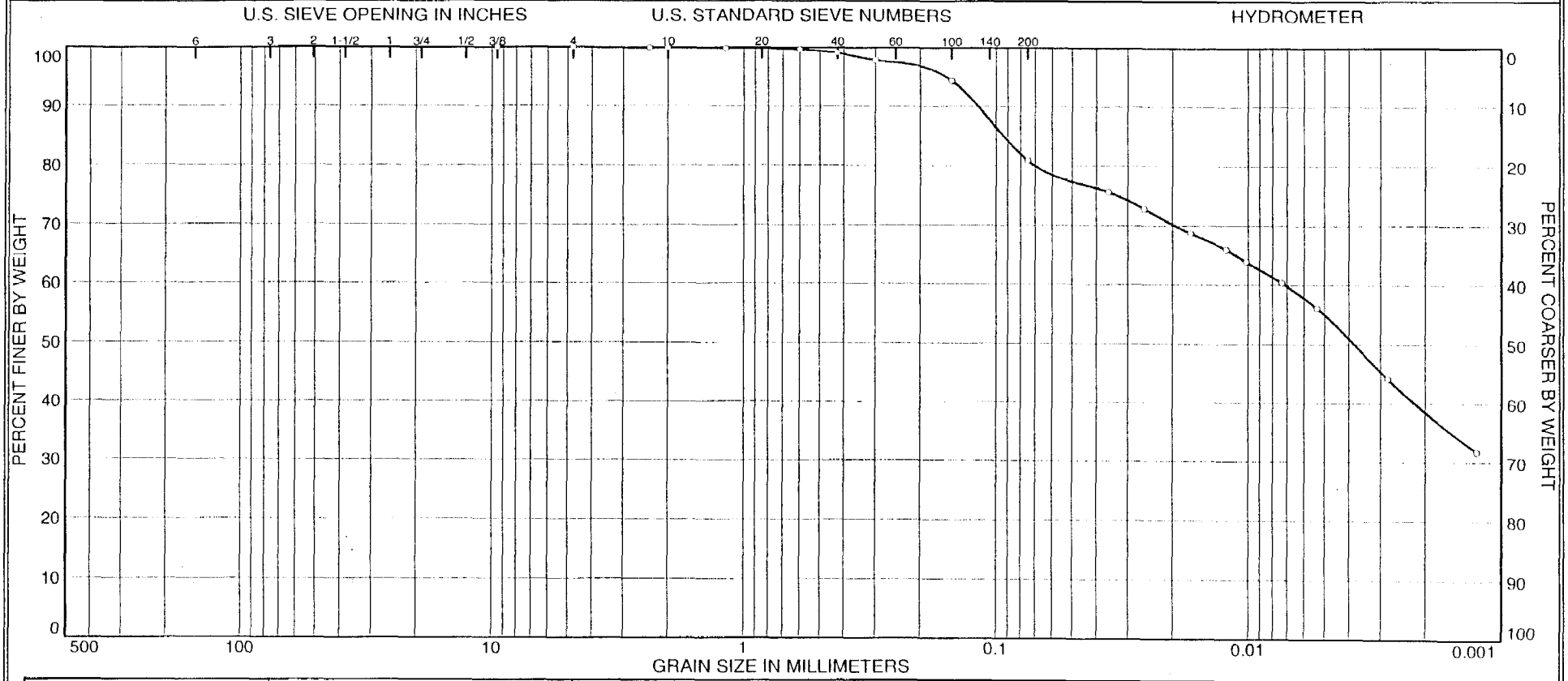


Liquid Limit= 30.9
Plastic Limit= 14.6
Plasticity Index= 16.3

Plastic Limit Data

Run No.	1	2	3	4
Wet+Tare	9.31	8.67		
y+Tare	8.66	8.12		
Tare	4.30	4.31		
Moisture	14.9	14.4		

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL		% SAND			% FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	0.0	0.1	0.9	18.1	25.9	55.0

	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PL
○	D&D TSF 06-26 soils		8' - 9.5'	6/9/03	CL	Lean clay with sand	15.0%	30.0	16.3

Client

Project

Project No. | Plate

INEEL MATERIALS LAB

○ Sample #1RA17702PR sampled May 14th, 2003. Borehole #2 North

Lab Log #020

GRAIN SIZE DISTRIBUTION TEST DATA

Client:
Project:
Project Number:

Sample Data

Source: D&D TSF 06-26 soils
Sample No.: 1RA17702PR
Elev. or Depth: 8' - 9.5' **Sample Length (in./cm.):** LL #020
Location:
Description: Lean clay with sand
Date: 6/9/03 **Natural Moisture:** 15.0%
Liquid Limit: 30.0 **Plastic Limit:** 16.3 **USCS Class.:** CL
Testing Remarks: Sample #1RA17702PR sampled May 14th, 2003. Borehole #2 North

Lab Log #020

Mechanical Analysis Data

	Initial
Dry sample and tare=	351.81
Tare =	103.84
Dry sample weight =	247.97

Sieve tare method

Sieve	Weight retained	Sieve tare	Percent finer
3/8 inch	0.00	0.00	100.0
# 4	0.00	0.00	100.0
# 8	0.17	0.00	99.9
# 10	0.08	0.00	99.9
# 16	0.34	0.00	99.8
# 30	0.50	0.00	99.6
# 40	1.48	0.00	99.0
# 50	2.81	0.00	97.8
# 100	8.81	0.00	94.3
# 200	33.06	0.00	80.9

Hydrometer Analysis Data

Separation sieve is #10
Percent -#10 based upon complete sample= 99.9
Weight of hydrometer sample: 75.755
Hygroscopic moisture correction:
Moist weight & tare = 356.82
Dry weight & tare = 351.81
Tare = 103.84
Hygroscopic moisture= 2.0 %
Calculated biased weight= 74.33
Automatic temperature correction
Composite correction at 20 deg C = -4.0

Meniscus correction only= 1.0
Specific gravity of solids= 2.50
Specific gravity correction factor= 1.038
Hydrometer type: 152H
Effective depth L= 16.294964 - 0.164 x Rm

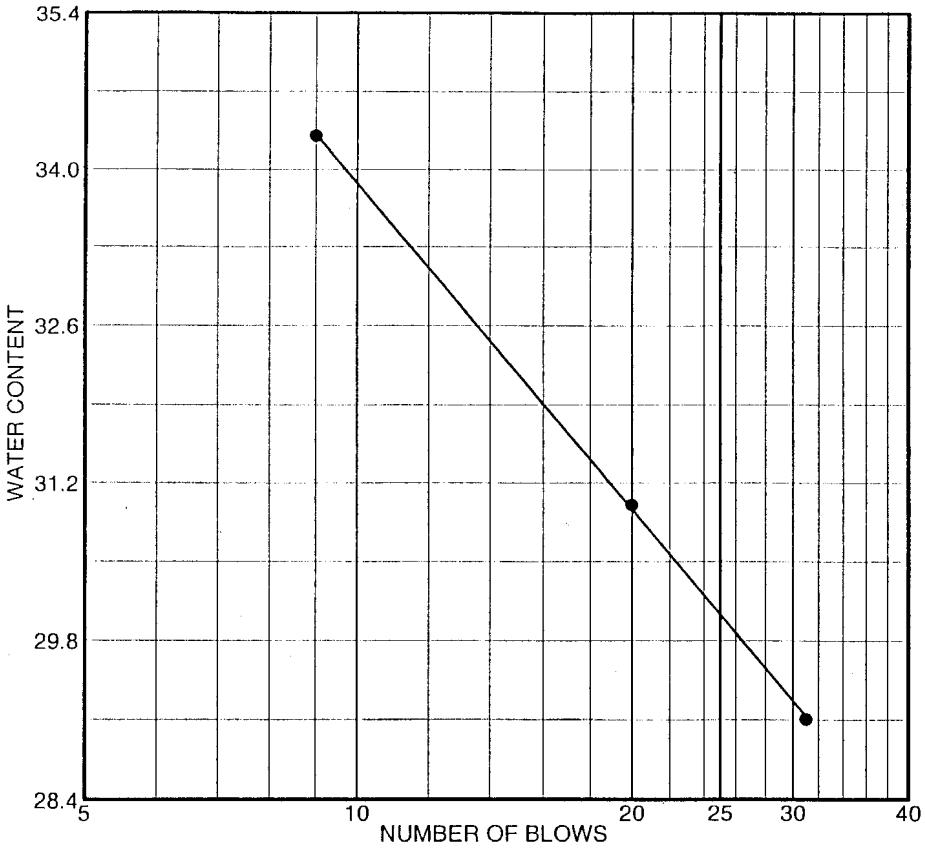
Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
1.00	23.0	57.5	54.2	0.0138	58.5	6.7	0.0357	75.6
2.00	23.0	55.5	52.2	0.0138	56.5	7.0	0.0259	72.8
5.00	23.0	52.5	49.2	0.0138	53.5	7.5	0.0169	68.7
10.00	23.0	50.5	47.2	0.0138	51.5	7.8	0.0122	65.9
15.00	23.0	49.0	45.7	0.0138	50.0	8.1	0.0101	63.8
30.00	23.0	46.5	43.2	0.0138	47.5	8.5	0.0073	60.3
60.00	23.0	43.5	40.2	0.0138	44.5	9.0	0.0053	56.1
250.00	23.0	35.0	31.7	0.0138	36.0	10.4	0.0028	44.2
1440.00	23.0	26.0	22.7	0.0138	27.0	11.9	0.0013	31.7

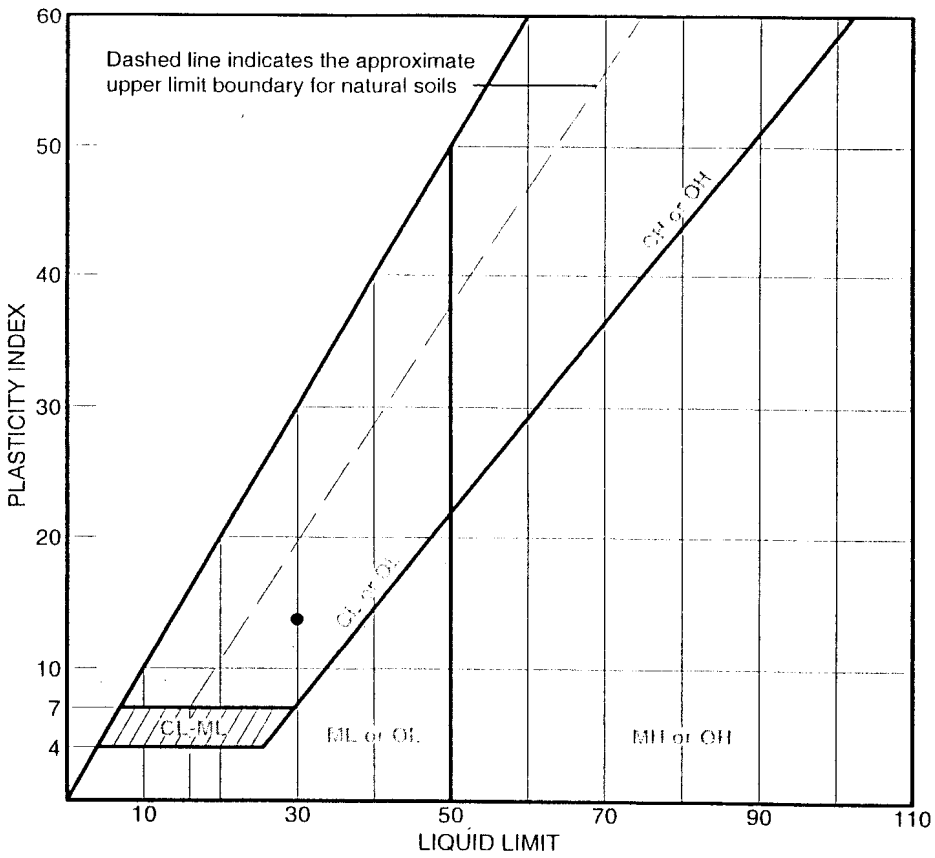
Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% + 3" = **% GRAVEL =**
% SAND = 19.1 **(% coarse =** 0.1 **% medium =** 0.9 **% fine =** 18.1)
% SILT = 25.9 **% CLAY =** 55.0

D_{85}= 0.09 D_{60}= 0.01 D_{50}= 0.00

LIQUID AND PLASTIC LIMITS TEST REPORT





	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PI
●	D&D TSF 06-26 soils		8' - 9.5'	6/9/03	CL	Lean clay with sand	15.0%	30.0	13.7

Client

Project

Project No. | Plate

INEEL MATERIALS LAB

● Sample #1RA17702PR Sampled May 14th, 2003. Borehole #2 North.

Lab Log #020

LIQUID AND PLASTIC LIMIT TEST DATA

Client:
Project:
Project Number:

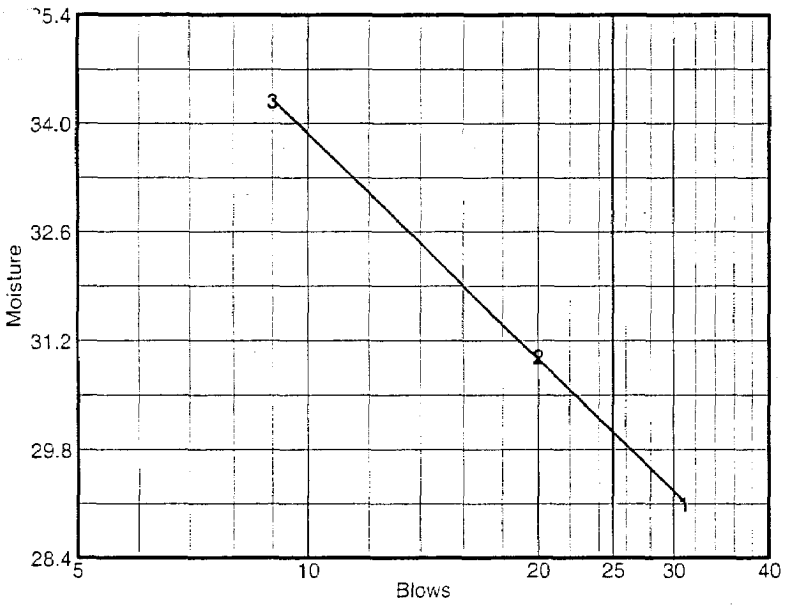
Sample Data

Source: D&D TSF 06-26 soils
Sample No.: 1RA17702PR
Elev. or Depth: 8' - 9.5' **Sample Length (in./cm.):** LL #020
Location:
Description: Lean clay with sand
Date: 6/9/03 **Natural Moisture:** 15.0%
USCS Class.: CL **AASHTO Class.:** A-6(10)
Testing Remarks: Sample #1RA17702PR Sampled May 14th, 2003. Borehole #2 North.

Lab Log #020

Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare	25.83	25.12	23.92			
Dry+Tare	22.50	21.79	20.65			
Tare	11.07	11.06	11.13			
# Blows	31	20	9			
Moisture	29.1	31.0	34.3			

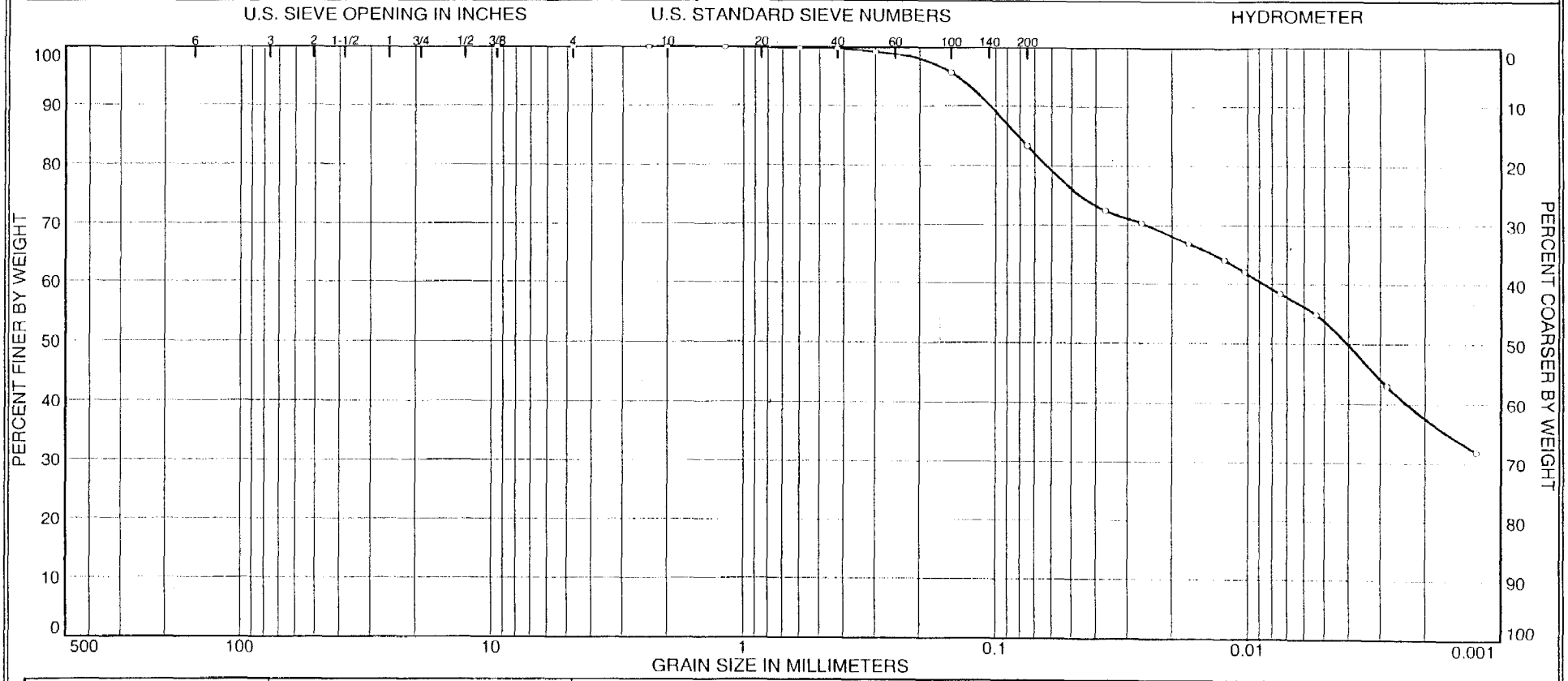


Liquid Limit= 30.0
Plastic Limit= 16.3
Plasticity Index= 13.7

Plastic Limit Data

Run No.	1	2	3	4
Wet+Tare	8.21	8.73		
Dry+Tare	7.63	8.15		
Tare	4.30	4.31		
Moisture	17.4	15.1		

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL		% SAND			% FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	0.0	0.0	0.3	16.4	29.5	53.8

	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PL
○	D&D TSF 06-26 soils		11.0' - 12.5'	6/9/03	CL	Lean clay with sand	14.6%	31.1	15.6

Client

Project

Project No. | Plate

INEEL MATERIALS LAB

○ Sample #IRA17703PR sampled May 14th, 2003. BoreHole #3 North

Lab Log #021.

GRAIN SIZE DISTRIBUTION TEST DATA

Client:
Project:
Project Number:

Sample Data

Source: D&D TSF 06-26 soils
Sample No.: 1RA17703PR
Elev. or Depth: 11.0' - 12.5' **Sample Length (in./cm.):** LL #021
Location:
Description: Lean clay with sand
Date: 6/9/03 **Natural Moisture:** 14.6%
Liquid Limit: 31.1 **Plastic Limit:** 15.6 **USCS Class.:** CL
Testing Remarks: Sample #1RA17703PR sampled May 14th, 2003. BoreHole #3 North Lab Log #021.

Mechanical Analysis Data

	Initial
Dry sample and tare=	404.82
Tare =	106.62
Dry sample weight =	298.20

Sieve tare method

Sieve	Weight retained	Sieve tare	Percent finer
3/8 inch	0.00	0.00	100.0
# 4	0.00	0.00	100.0
# 8	0.00	0.00	100.0
# 10	0.00	0.00	100.0
# 16	0.05	0.00	100.0
# 30	0.41	0.00	99.8
# 40	0.54	0.00	99.7
# 50	1.55	0.00	99.1
# 100	10.46	0.00	95.6
# 200	36.81	0.00	83.3

Hydrometer Analysis Data

Separation sieve is #10
Percent -#10 based upon complete sample= 100.0
Weight of hydrometer sample: 75.58
Hygroscopic moisture correction:
Moist weight & tare = 410.92
Dry weight & tare = 404.82
Tare = 106.62
Hygroscopic moisture= 2.0 %
Calculated biased weight= 74.06
Automatic temperature correction
Composite correction at 20 deg C = -4.0

Meniscus correction only= 1.2
cific gravity of solids= 2.50
Specific gravity correction factor= 1.038
Hydrometer type: 152H
Effective depth L= 16.294964 - 0.164 x Rm

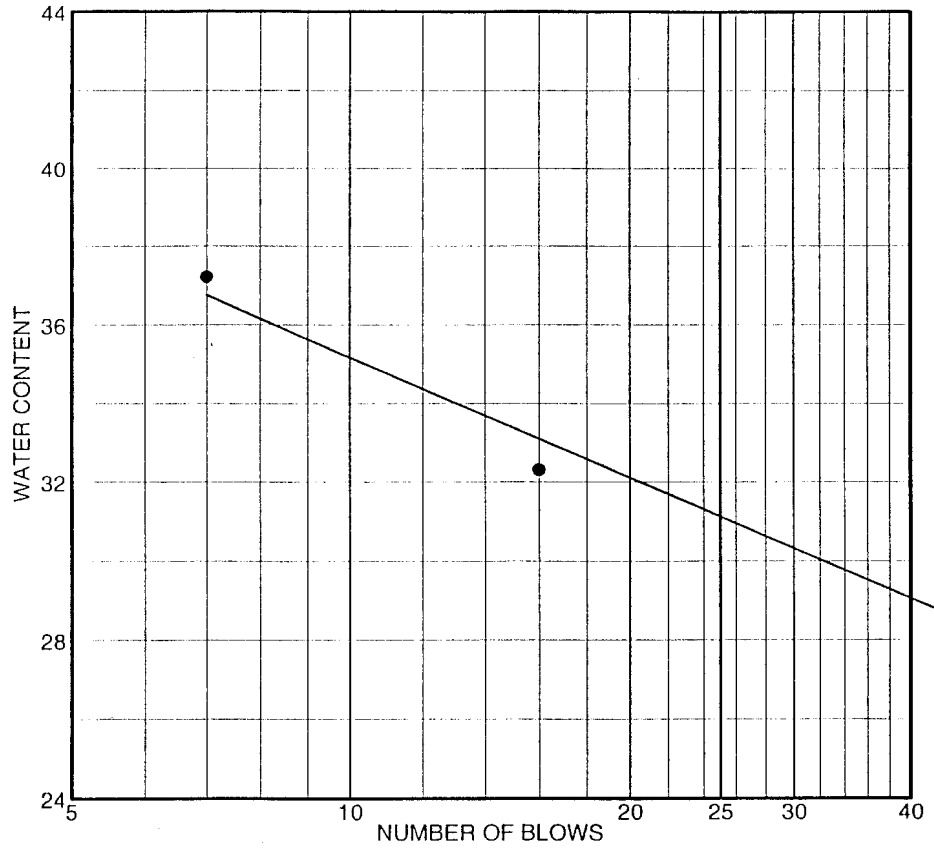
Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
1.00	23.0	55.0	51.7	0.0138	56.2	7.1	0.0367	72.4
2.00	23.0	53.5	50.2	0.0138	54.7	7.3	0.0264	70.3
5.00	23.0	51.0	47.7	0.0138	52.2	7.7	0.0172	66.8
10.00	23.0	49.0	45.7	0.0138	50.2	8.1	0.0124	64.0
15.00	23.0	47.5	44.2	0.0138	48.7	8.3	0.0103	61.9
30.00	23.0	45.0	41.7	0.0138	46.2	8.7	0.0074	58.4
60.00	23.0	42.5	39.2	0.0138	43.7	9.1	0.0054	54.9
250.00	23.0	34.0	30.7	0.0138	35.2	10.5	0.0028	43.0
1440.00	23.0	26.0	22.7	0.0138	27.2	11.8	0.0013	31.8

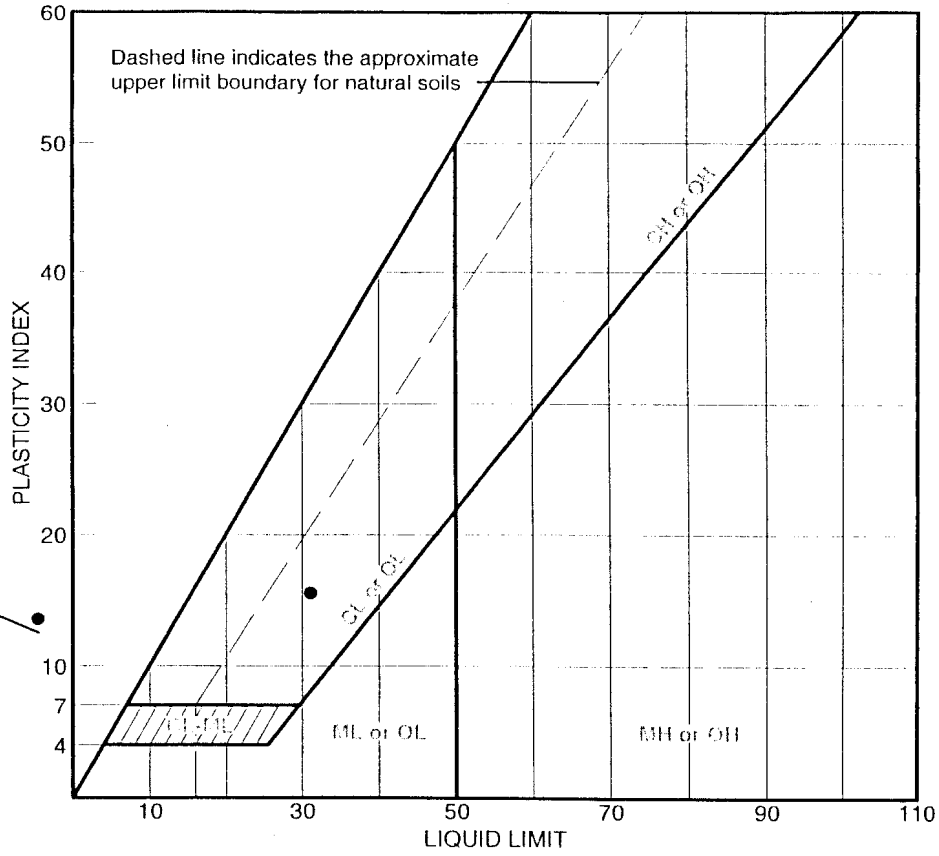
Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% + 3" = % GRAVEL =
% SAND = 16.7 (% coarse = 0.0 % medium = 0.3 % fine = 16.4)
% SILT = 29.5 % CLAY = 53.8

D_{85}= 0.08 D_{60}= 0.01 D_{50}= 0.00

LIQUID AND PLASTIC LIMITS TEST REPORT





	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PI
●	D&D TSF 06-26 soils		11.0' - 12.5'	6/9/03	CL	Lean clay with sand	14.6%	31.1	15.5

Client

Project

Project No. | Plate

INEEL MATERIALS LAB

● Sample #IRA17703PR sampled May 14th, 2003. Bore Hole #3 North

Lab Log #021

LIQUID AND PLASTIC LIMIT TEST DATA

Client:
Project:
Project Number:

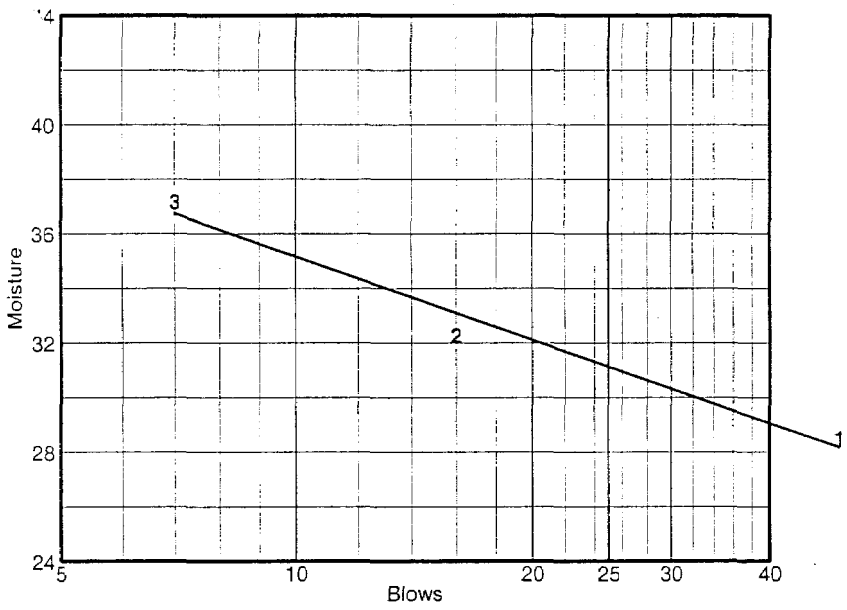
Sample Data

Source: D&D TSF 06-26 soils
Sample No.: 1RA17703PR
Elev. or Depth: 11.0' - 12.5' **Sample Length (in./cm.):** LL #021
Location:
Description: Lean clay with sand
Date: 6/9/03 **Natural Moisture:** 14.6%
USCS Class.: CL **AASHTO Class.:** A-6(11)
Testing Remarks: Sample #1RA17703PR sampled May 14th, 2003. Bore Hole #3 North

Lab Log #021

Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare	23.72	26.94	24.71			
Dry+Tare	20.89	23.07	21.00			
Tare	10.96	11.09	11.04			
# Blows	49	16	7			
Moisture	28.5	32.3	37.2			

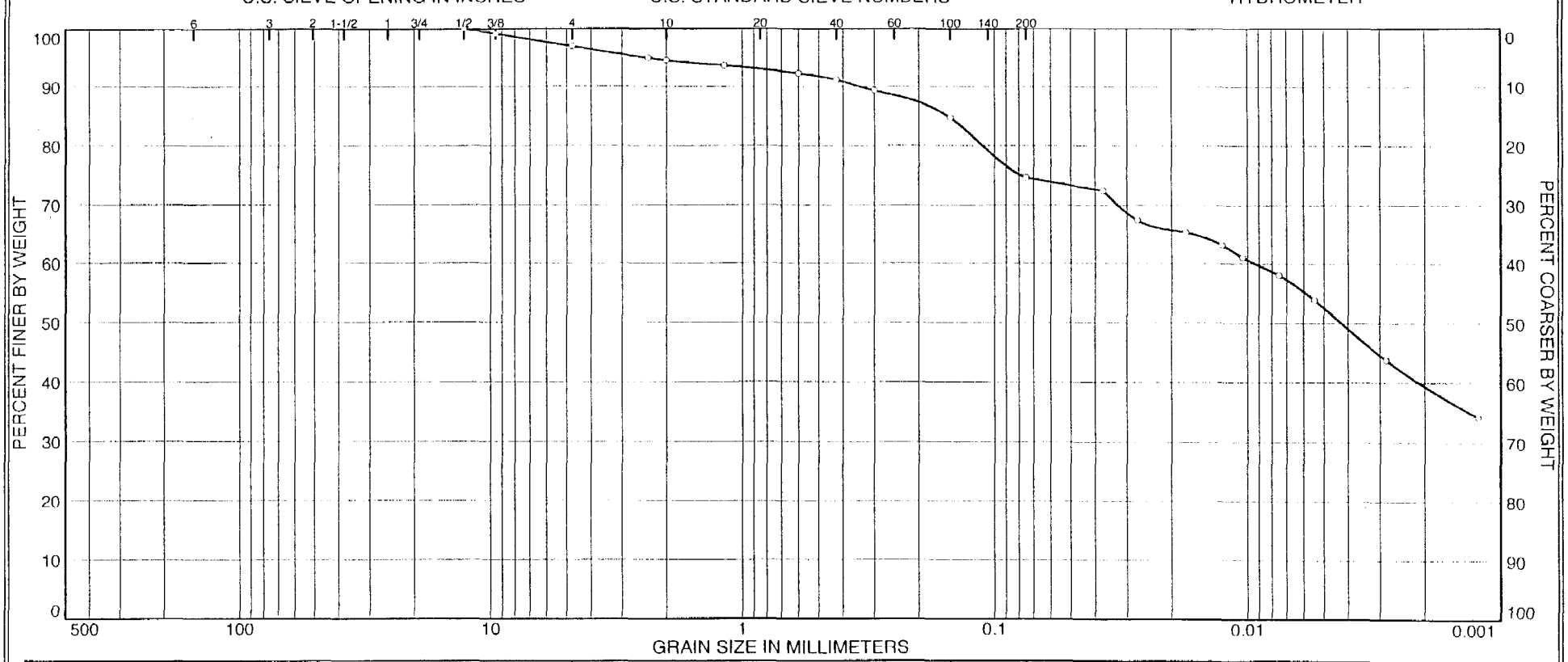


Liquid Limit= 31.1
Plastic Limit= 15.6
Plasticity Index= 15.5

Plastic Limit Data

Run No.	1	2	3	4	
Wet+Tare	10.10	9.23			
y+Tare	9.32	8.57			
Tare	4.29	4.33			
Moisture	15.5	15.6			

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL		% SAND			% FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	3.2	2.4	3.3	16.5	22.1	52.5

	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PL
○	D&D TSF 06-26 soils		14.0' - 15.5'	6/9/03	CL	Lean clay with sand	19.6%	35.7	14.8

Client

Project

Project No. | Plate

INEEL MATERIALS LAB

○ Sample #IRA17704PR sampled May 14th, 2003. Bore Hole #4 North

Lab Log #022

GRAIN SIZE DISTRIBUTION TEST DATA

Client:
Project:
Project Number:

Sample Data

Source: D&D TSF 06-26 soils
Sample No.: 1RA17704PR
Elev. or Depth: 14.0' - 15.5' **Sample Length (in./cm.):** LL #022
Location:
Description: Lean clay with sand
Date: 6/9/03 **Natural Moisture:** 19.6%
Liquid Limit: 35.7 **Plastic Limit:** 14.8 **USCS Class.:** CL
Testing Remarks: Sample #1RA17704PR sampled May 14th, 2003. Bore Hole #4 Lab Log #022

Mechanical Analysis Data

	Initial
Dry sample and tare=	401.67
Tare =	105.11
Dry sample weight =	296.56

Sieve tare method

Sieve	Weight retained	Sieve tare	Percent finer
1/2 inch	0.00	0.00	100.0
3/8 inch	2.93	0.00	99.0
4	6.62	0.00	96.8
8	5.80	0.00	94.8
# 10	1.11	0.00	94.4
# 16	2.68	0.00	93.5
# 30	3.86	0.00	92.2
# 40	3.33	0.00	91.1
# 50	5.41	0.00	89.3
# 100	13.71	0.00	84.7
# 200	29.79	0.00	74.6

Hydrometer Analysis Data

Separation sieve is #10
Percent -#10 based upon complete sample= 94.4
Weight of hydrometer sample: 69.21
Hygroscopic moisture correction:
  Moist weight & tare = 404.61
  Dry weight & tare = 401.67
  Tare = 105.11
  Hygroscopic moisture= 1.0 %
Calculated biased weight= 72.60
Automatic temperature correction
  Composite correction at 20 deg C = -4.0

Meniscus correction only= 1.0
Specific gravity of solids= 2.50
Specific gravity correction factor= 1.038
Hydrometer type: 152H
  Effective depth L= 16.294964 - 0.164 x Rm

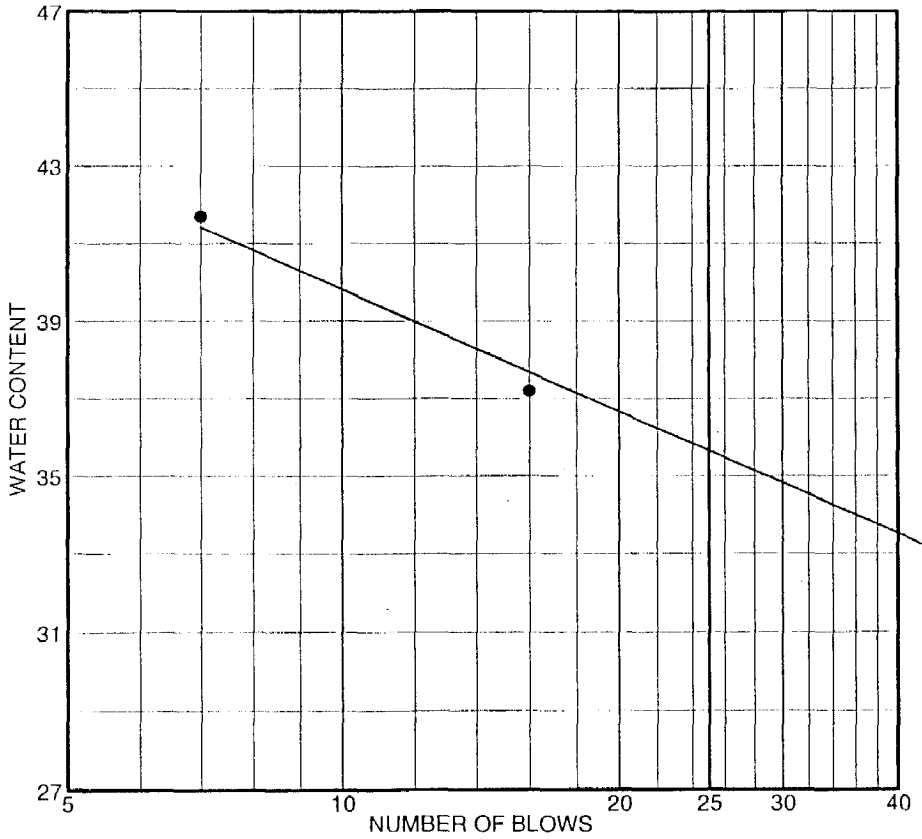
Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
1.00	23.0	54.0	50.7	0.0138	55.0	7.3	0.0372	72.4
2.00	23.0	50.5	47.2	0.0138	51.5	7.8	0.0273	67.4
5.00	23.0	49.0	45.7	0.0138	50.0	8.1	0.0176	65.3
10.00	23.0	47.5	44.2	0.0138	48.5	8.3	0.0126	63.1
15.00	23.0	46.0	42.7	0.0138	47.0	8.6	0.0104	61.0
30.00	23.0	44.0	40.7	0.0138	45.0	8.9	0.0075	58.1
60.00	23.0	41.0	37.7	0.0138	42.0	9.4	0.0055	53.9
250.00	23.0	34.0	30.7	0.0138	35.0	10.6	0.0028	43.8
1440.00	24.0	27.0	24.0	0.0136	28.0	11.7	0.0012	34.2

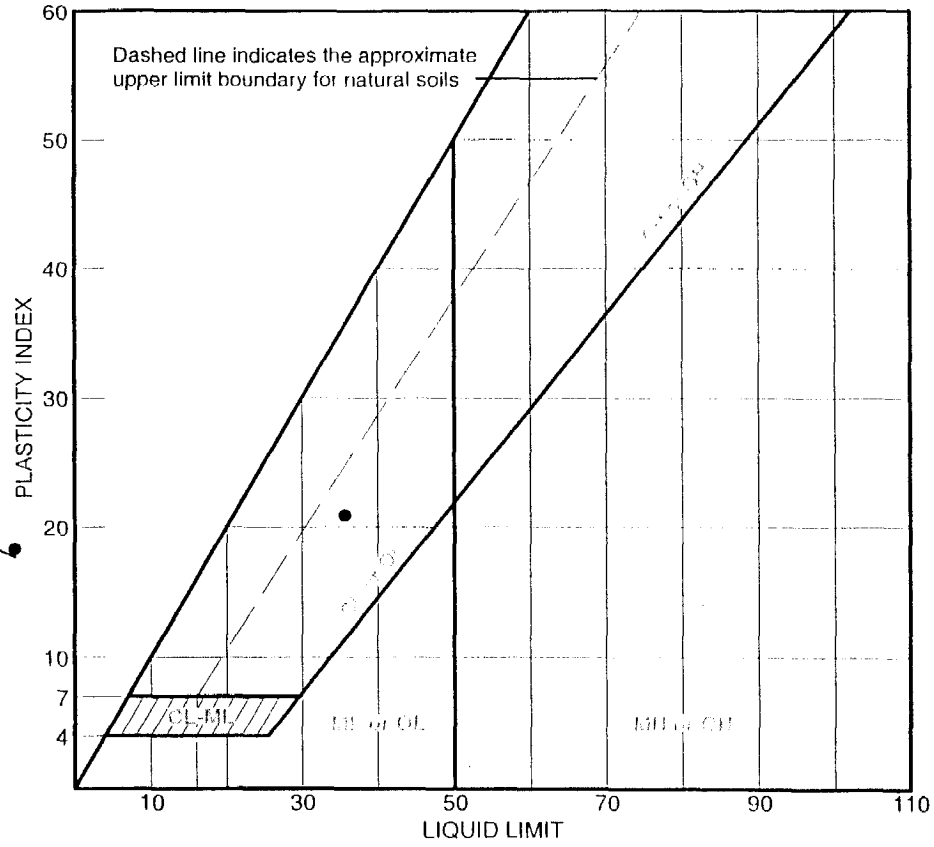
Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% + 3" = % GRAVEL = 3.2 (% coarse = % fine = 3.2)
% SAND = 22.2 (% coarse = 2.4 % medium = 3.3 % fine = 16.5)
% SILT = 22.1 % CLAY = 52.5

D_{85}= 0.15 D_{60}= 0.01 D_{50}= 0.00

LIQUID AND PLASTIC LIMITS TEST REPORT





	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PI
●	D&D TSF 06-26 soils		14.0' - 15.5'	6/9/03	CL	Lean clay with sand	19.6%	35.7	20.9

Client

Project

Project No. | Plate

INEEL MATERIALS LAB

● Sample IRA17704PR sampled May 14th, 2003. Bore Hole #4 North

Lab Log #022

LIQUID AND PLASTIC LIMIT TEST DATA

Client:
Project:
Project Number:

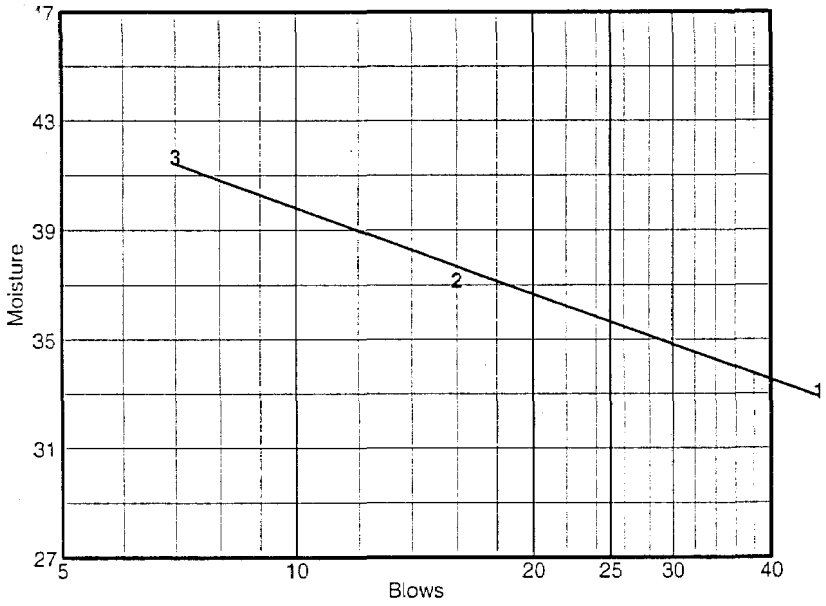
Sample Data

Source: D&D TSF 06-26 soils
Sample No.: 1RA17704PR
Elev. or Depth: 14.0' - 15.5' **Sample Length (in./cm.):** LL #022
Location:
Description: Lean clay with sand
Date: 6/9/03 **Natural Moisture:** 19.6%
USCS Class.: CL **AASHTO Class.:** A-6(14)
Testing Remarks: Sample 1RA17704PR sampled May 14th, 2003. Bore Hole #4 North

Lab Log #022

Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare	23.35	20.93	25.38			
Dry+Tare	20.27	18.26	21.16			
Tare	10.96	11.09	11.04			
# Blows	46	16	7			
Moisture	33.1	37.2	41.7			

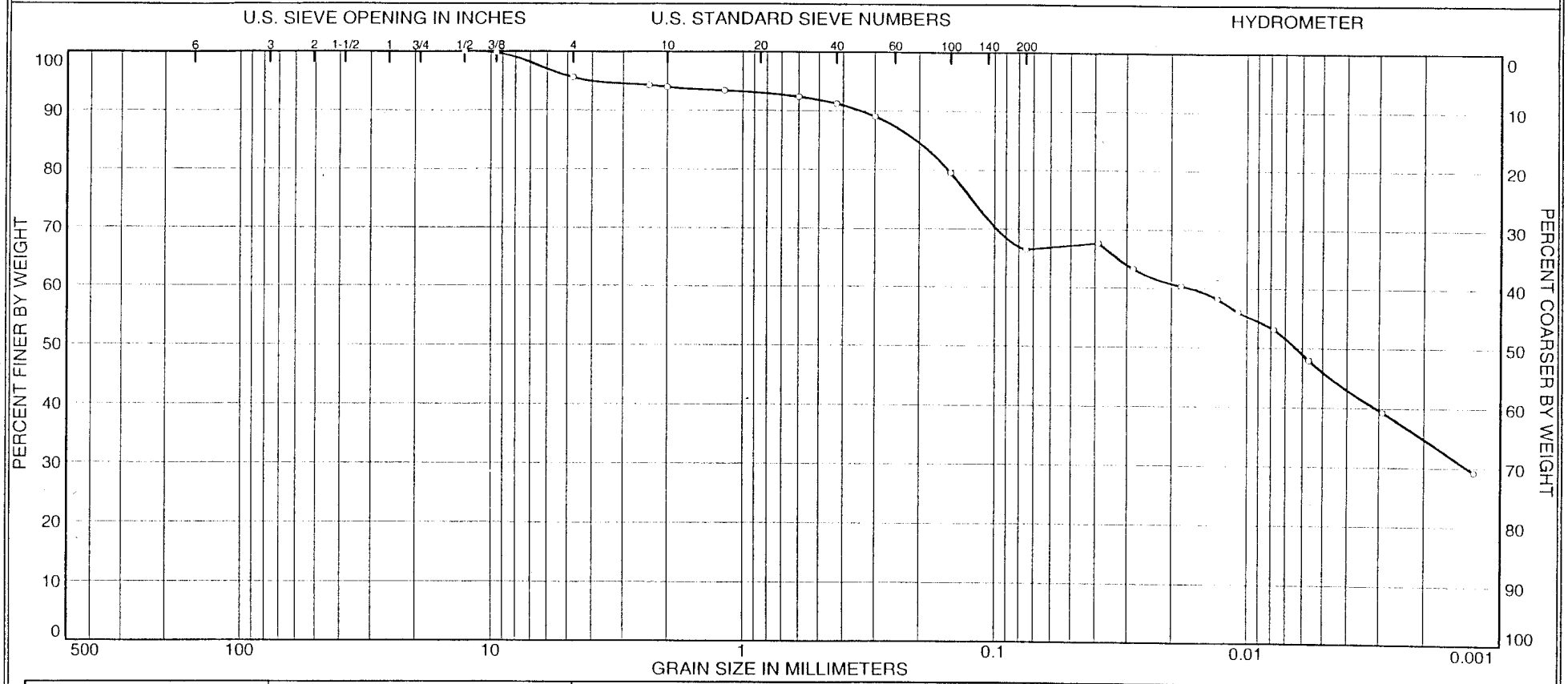


Liquid Limit= 35.7
Plastic Limit= 14.8
Plasticity Index= 20.9

Plastic Limit Data

Run No.	1	2	3	4	
Wet+Tare	8.54	8.38			
y+Tare	7.99	7.86			
Tare	4.29	4.33			
Moisture	14.9	14.7			

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL		% SAND			% FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	4.5	1.6	2.7	24.8	20.4	46.0

	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PL
○	D&D TSF 06-26 soils		17.0' - 18.5'	6/9/03	CL	Sandy lean clay	16.1%	32.7	14.7

Client

Project

Project No. | Plate

INEEL MATERIALS LAB

○ Sample #IRA17705PR sampled May 14th, 2003. Bore Hole #5 North

Lab Log #23

GRAIN SIZE DISTRIBUTION TEST DATA

Client:
Project:
Project Number:

Sample Data

Source: D&D TSF 06-26 soils
Sample No.: 1RA17705PR
Elev. or Depth: 17.0' - 18.5' **Sample Length (in./cm.):** LL #023
Location:
Description: Sandy lean clay
Date: 6/9/03 **Natural Moisture:** 16.1%
Liquid Limit: 32.7 **Plastic Limit:** 14.7 **USCS Class.:** CL
Testing Remarks: Sample #1RA17705PR sampled May 14th, 2003. Bore Hole #5 North

Lab Log #23

Mechanical Analysis Data

	Initial
Dry sample and tare=	345.32
Tare =	103.67
Dry sample weight =	241.65

Sieve tare method

Sieve	Weight retained	Sieve tare	Percent finer
1/2 inch	0.00	0.00	100.0
3/8 inch	0.72	0.00	99.7
# 4	10.23	0.00	95.5
# 8	3.11	0.00	94.2
# 10	0.59	0.00	93.9
# 16	1.57	0.00	93.3
# 30	2.45	0.00	92.3
# 40	2.52	0.00	91.2
# 50	5.43	0.00	89.0
# 100	22.98	0.00	79.5
# 200	31.68	0.00	66.4

Hydrometer Analysis Data

Separation sieve is #10
Percent -#10 based upon complete sample= 93.9
Weight of hydrometer sample: 68.82
Hygroscopic moisture correction:
Moist weight & tare = 350.72
Dry weight & tare = 345.32
Tare = 103.67
Hygroscopic moisture= 2.2 %
Calculated biased weight= 71.69
Automatic temperature correction
Composite correction at 20 deg C = -4.0

Meniscus correction only= 1.0
Specific gravity of solids= 2.50
Specific gravity correction factor= 1.038

Hydrometer type: 152H
Effective depth L= 16.294964 - 0.164 x Rm

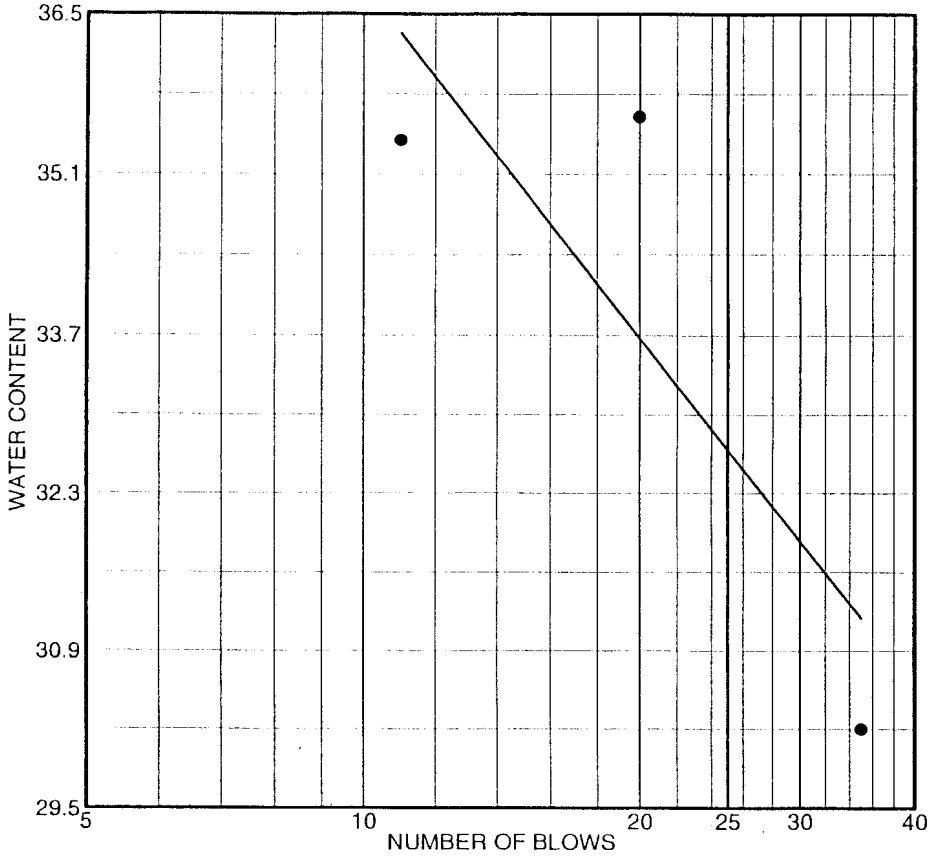
Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
1.00	23.0	50.0	46.7	0.0138	51.0	7.9	0.0388	67.6
2.00	23.0	47.0	43.7	0.0138	48.0	8.4	0.0283	63.2
5.00	23.0	45.0	41.7	0.0138	46.0	8.8	0.0182	60.3
10.00	23.0	43.5	40.2	0.0138	44.5	9.0	0.0131	58.2
15.00	23.0	42.0	38.7	0.0138	43.0	9.2	0.0108	56.0
30.00	23.0	40.0	36.7	0.0138	41.0	9.6	0.0078	53.1
60.00	23.0	36.5	33.2	0.0138	37.5	10.1	0.0057	48.0
250.00	23.0	30.5	27.2	0.0138	31.5	11.1	0.0029	39.3
1440.00	23.0	23.5	20.2	0.0138	24.5	12.3	0.0013	29.2

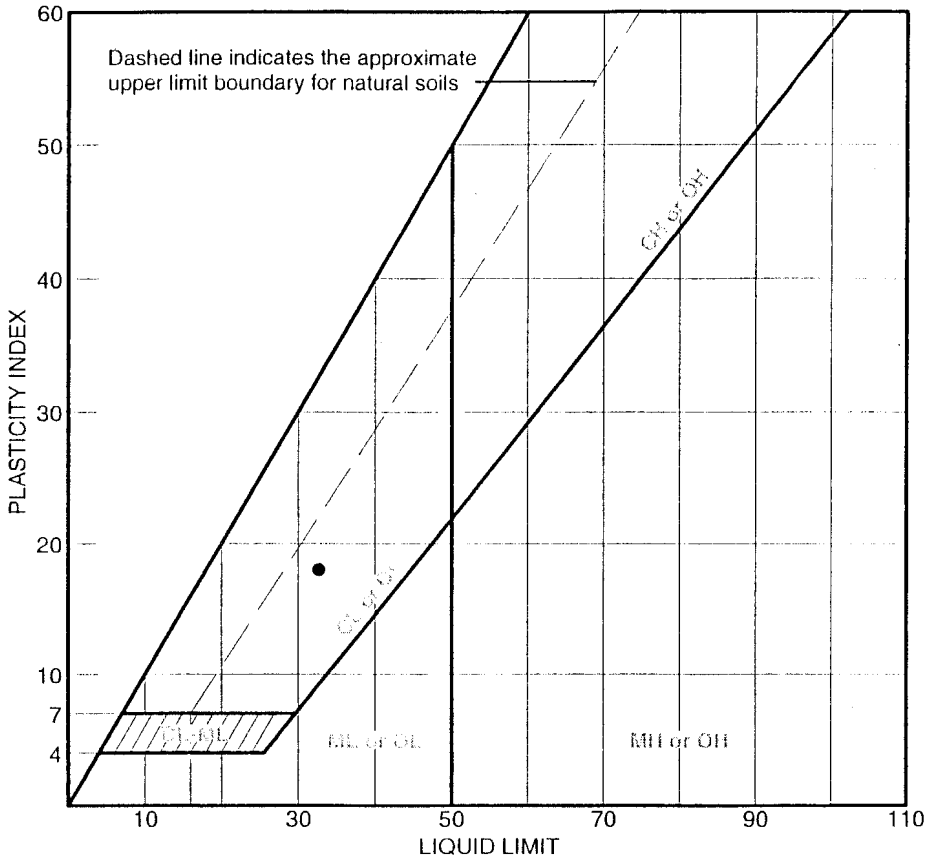
Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% + 3" = % GRAVEL = 4.5 (% coarse = % fine = 4.5)
% SAND = 29.1 (% coarse = 1.6 % medium = 2.7 % fine = 24.8)
% SILT = 20.4 % CLAY = 46.0

D_{85}= 0.21 D_{60}= 0.02 D_{50}= 0.01
D_{30}= 0.00

LIQUID AND PLASTIC LIMITS TEST REPORT





	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PI
●	D&D TSF 06-26 soils		17.0' - 18.5'	6/9/03	CL	Sandy lean clay	16.1%	32.7	18.0

Client

Project

Project No. | Plate

INEEL MATERIALS LAB

● Sample 1PR17705PR Sampled May 14th, 2003. Bore Hole #5 North

Lab Log #023

LIQUID AND PLASTIC LIMIT TEST DATA

Client:
Project:
Project Number:

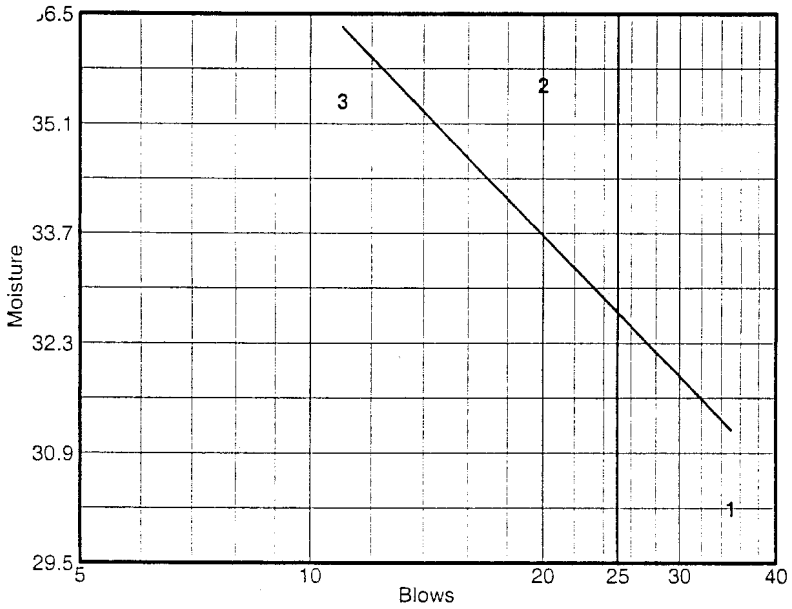
Sample Data

Source: D&D TSF 06-26 soils
Sample No.: 1RA17705PR
Elev. or Depth: 17.0′ - 18.5′ **Sample Length (in./cm.):** LL #023
Location:
Description: Sandy lean clay
Date: 6/9/03 **Natural Moisture:** 16.1%
USCS Class.: CL **AASHTO Class.:** A-6(9)
Testing Remarks: Sample 1PR17705PR Sampled May 14th, 2003. Bore Hole #5 North

Lab Log #023

Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare	25.81	24.80	25.48			
Dry+Tare	22.40	21.20	21.72			
Tare	11.12	11.10	11.09			
# Blows	35	20	11			
Moisture	30.2	35.6	35.4			



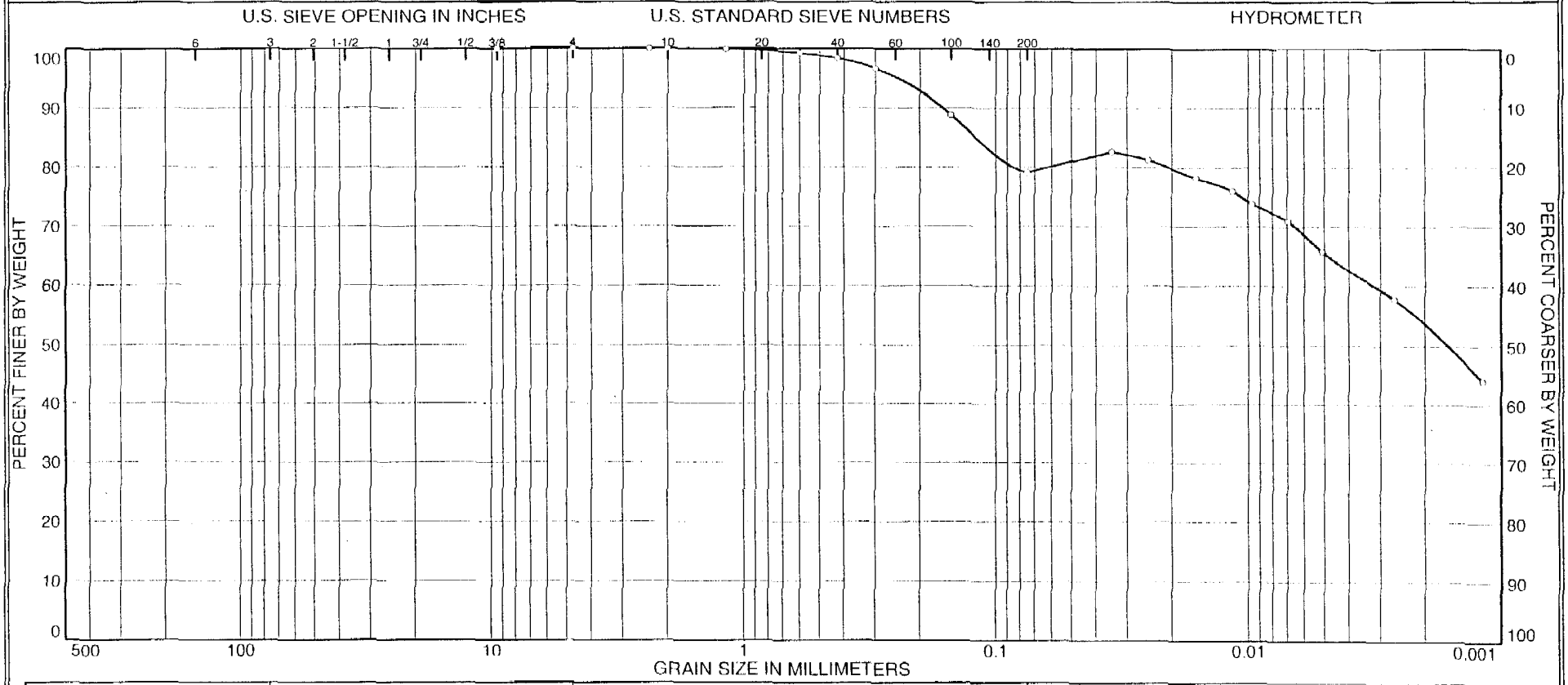
Liquid Limit= 32.7
Plastic Limit= 14.7
Plasticity Index= 18.0

LIQUID AND PLASTIC LIMIT TEST DATA

Plastic Limit Data

Run No.	1	2	3	4
Wet+Tare	9.06	9.38		
Dry+Tare	8.46	8.73		
Tare	4.33	4.36		
Moisture	14.5	14.9		

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL		% SAND			% FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	0.0	0.0	1.7	19.2	13.6	65.5

	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PL
○	D&D TSF 06-26 soils		20.0' - 21.5'	6/9/03	CL	Lean clay with sand	19.8%	45.2	17.9

Client

Project

Project No. Plate

INEEL MATERIALS LAB

○ Sample #IRA17706PR sampled May 15th, 2003. Borehole #6 North

Lab Log #024

GRAIN SIZE DISTRIBUTION TEST DATA

Client:
Project:
Project Number:

Sample Data

Source: D&D TSF 06-26 soils
Sample No.: 1RA17706PR
Elev. or Depth: 20.0' - 21.5' **Sample Length (in./cm.):** LL #024
Location:
Description: Lean clay with sand
Date: 6/9/03 **Natural Moisture:** 19.8%
Liquid Limit: 45.2 **Plastic Limit:** 17.9 **USCS Class.:** CL
Testing Remarks: Sample #1RA17706PR sampled May 15th, 2003. Borehole #6 North

Lab Log #024

Mechanical Analysis Data

	Initial
Dry sample and tare=	362.81
Tare =	105.66
Dry sample weight =	257.15

Sieve tare method

Sieve	Weight retained	Sieve tare	Percent finer
3/8 inch	0.00	0.00	100.0
# 4	0.00	0.00	100.0
# 8	0.00	0.00	100.0
# 10	0.00	0.00	100.0
# 16	0.23	0.00	99.9
# 30	1.91	0.00	99.2
# 40	2.20	0.00	98.3
# 50	4.52	0.00	96.6
# 100	20.04	0.00	88.8
# 200	24.91	0.00	79.1

Hydrometer Analysis Data

Separation sieve is #10
Percent -#10 based upon complete sample= 100.0
Weight of hydrometer sample: 74.12
Hygroscopic moisture correction:
  Moist weight & tare = 373.34
  Dry weight & tare = 362.81
  Tare = 105.66
  Hygroscopic moisture= 4.1 %
Calculated biased weight= 71.20
Automatic temperature correction
  Composite correction at 20 deg C = -4.0

Meniscus correction only= 1.0
Specific gravity of solids= 2.50
Specific gravity correction factor= 1.038
Hydrometer type: 152H

Effective depth L= 16.294964 - 0.164 x Rm

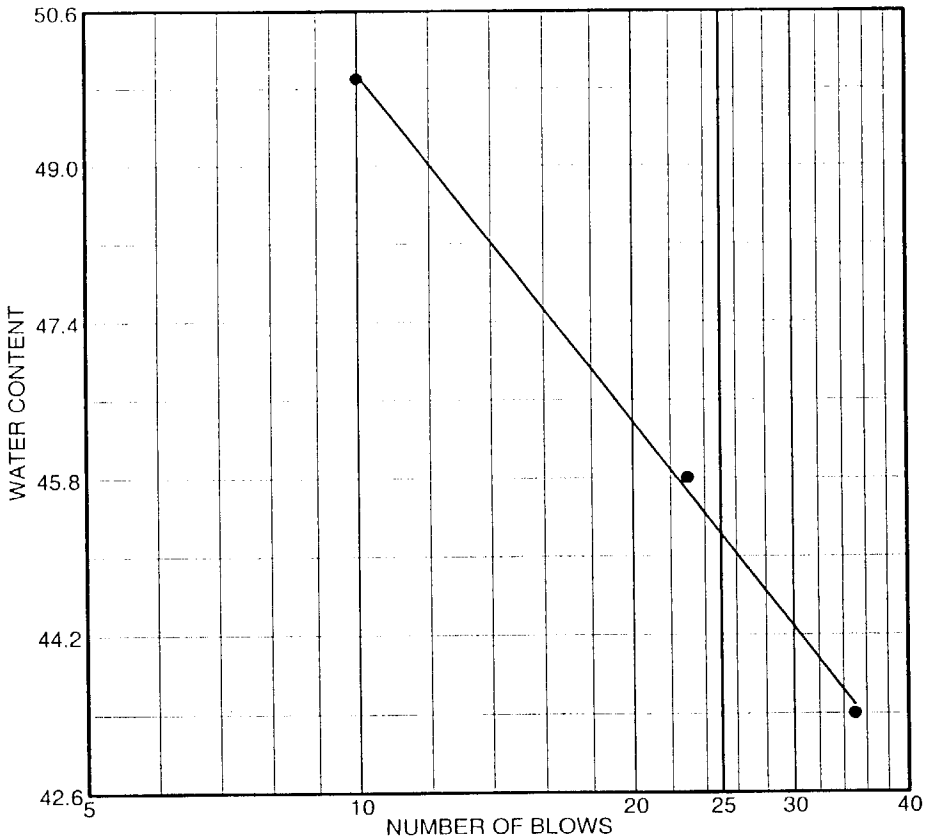
Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
1.00	23.0	60.0	56.7	0.0138	61.0	6.3	0.0346	82.6
2.00	23.0	59.0	55.7	0.0138	60.0	6.5	0.0248	81.2
5.00	23.0	57.0	53.7	0.0138	58.0	6.8	0.0161	78.2
10.00	23.0	55.5	52.2	0.0138	56.5	7.0	0.0116	76.0
15.00	23.0	54.0	50.7	0.0138	55.0	7.3	0.0096	73.9
30.00	23.0	52.0	48.7	0.0138	53.0	7.6	0.0069	70.9
60.00	23.0	48.5	45.2	0.0138	49.5	8.2	0.0051	65.8
250.00	23.0	43.0	39.7	0.0138	44.0	9.1	0.0026	57.8
1440.00	23.0	33.5	30.2	0.0138	34.5	10.6	0.0012	44.0

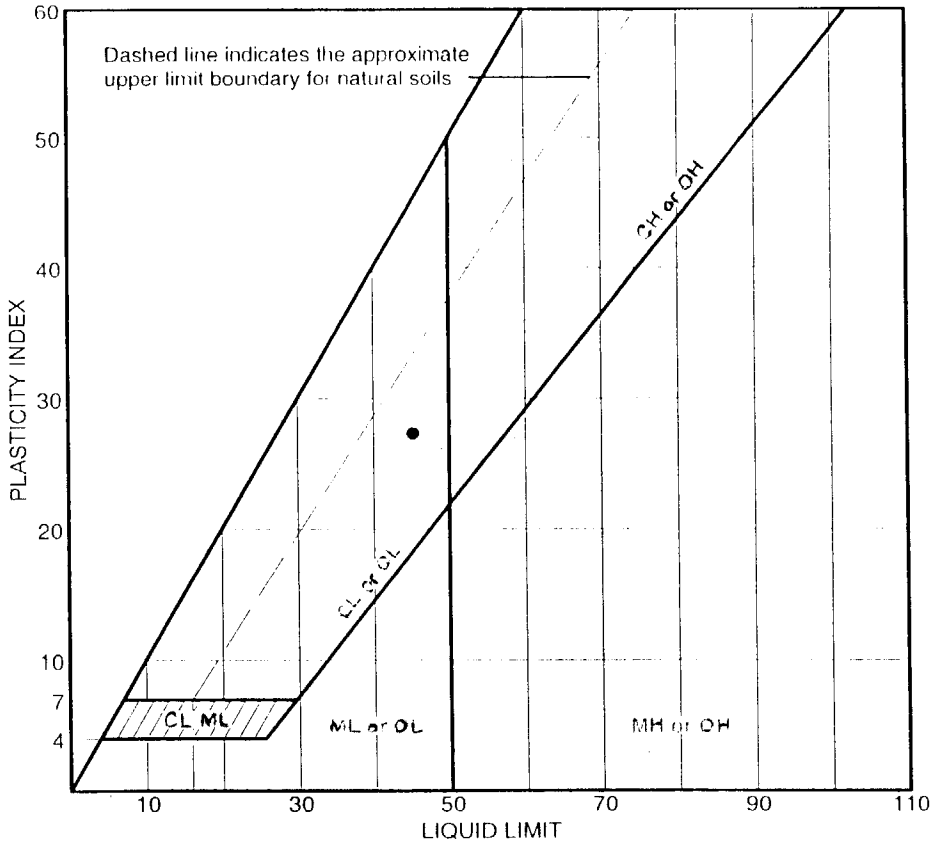
Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% + 3" = % GRAVEL =
% SAND = 20.9 (% coarse = 0.0 % medium = 1.7 % fine = 19.2)
% SILT = 13.6 % CLAY = 65.5

D_{85}= 0.12 D_{60}= 0.00 D_{50}= 0.00

LIQUID AND PLASTIC LIMITS TEST REPORT





	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PI
●	D&D TSF 06-26 soils		20.0' - 21.5'	6/9/03	CL	Lean clay with sand	19.8%	45.2	27.3

Client

Project

Project No. | Plate

INEEL MATERIALS LAB

● Sample #1RA17706PR sampled May 15th, 2003. Borehole #6 North

Lab Log #024

LIQUID AND PLASTIC LIMIT TEST DATA

Client:
Project:
Project Number:

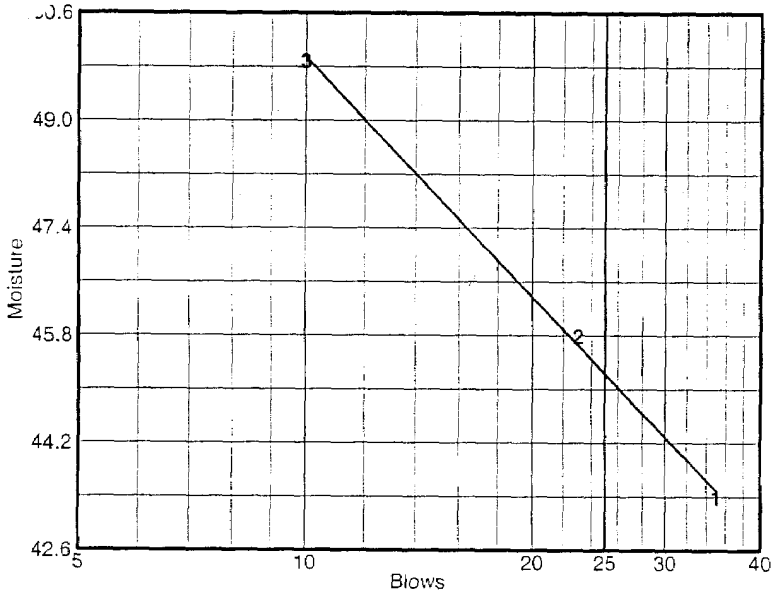
Sample Data

Source: D&D TSF 06-26 soils
Sample No.: 1RA17706PR
Elev. or Depth: 20.0' - 21.5' **Sample Length (in./cm.):** LL #024
Location:
Description: Lean clay with sand
Date: 6/9/03 **Natural Moisture:** 19.8%
USCS Class.: CL **AASHTO Class.:** A-7-6(21)
Testing Remarks: Sample #1RA17706PR sampled May 15th, 2003. Borehole #6 North

Lab Log #024

Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare	25.14	25.10	23.61			
Dry+Tare	20.90	20.71	19.46			
Tare	11.13	11.13	11.14			
# Blows	35	23	10			
Moisture	43.4	45.8	49.9			



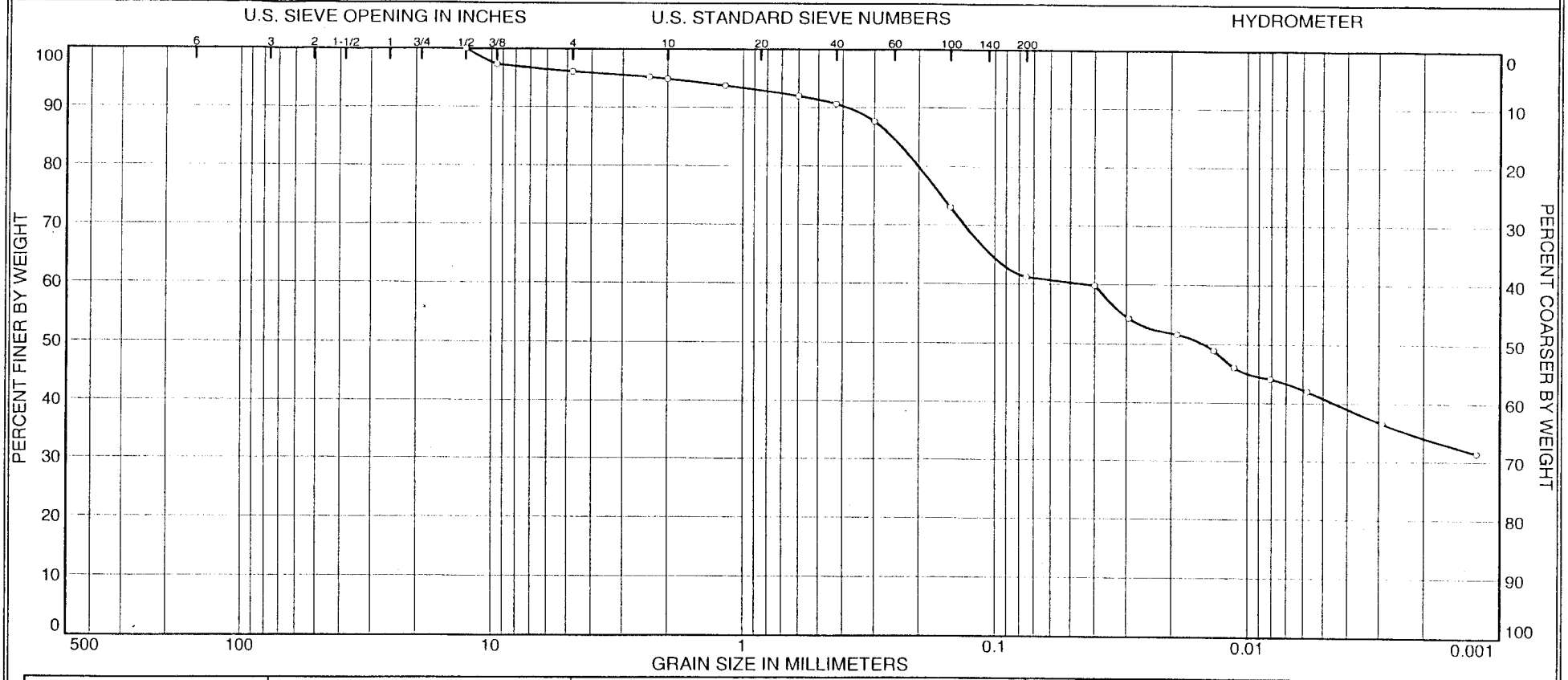
Liquid Limit= 45.2
Plastic Limit= 17.9
Plasticity Index= 27.3

LIQUID AND PLASTIC LIMIT TEST DATA

Plastic Limit Data

Run No.	1	2	3	4
Wet+Tare	8.09	8.14		
Dry+Tare	7.54	7.54		
Tare	4.34	4.32		
Moisture	17.2	18.6		

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL		% SAND			% FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	4.0	1.2	4.2	29.5	20.3	40.8

	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PL
○	D&D TSF 06-26 soils		23.0' - 24.5'	6/9/03	CL	Sandy lean clay	17.3%	34.9	14.0

Client

Project

Project No. | Plate

INEEL MATERIALS LAB

○ Sample #IRA17707PR sampled May 15th, 2003. Borehole #7 North

Lab Log #025

GRAIN SIZE DISTRIBUTION TEST DATA

Client:
Project:
Project Number:

Sample Data

Source: D&D TSF 06-26 soils
Sample No.: 1RA17707PR
Elev. or Depth: 23.0' - 24.5' **Sample Length (in./cm.):** LL #025
Location:
Description: Sandy lean clay
Date: 6/9/03 **Natural Moisture:** 17.3%
Liquid Limit: 34.9 **Plastic Limit:** 14.0 **USCS Class.:** CL
Testing Remarks: Sample #1RA17707PR sampled May 15th, 2003. Borehole #7

Lab Log #025

Mechanical Analysis Data

	Initial
Dry sample and tare=	381.93
Tare =	103.57
Dry sample weight =	278.36

Sieve tare method

Sieve	Weight retained	Sieve tare	Percent finer
1/2 inch	0.00	0.00	100.0
3/8 inch	7.93	0.00	97.2
# 4	3.30	0.00	96.0
# 8	2.53	0.00	95.1
# 10	0.64	0.00	94.8
# 16	3.18	0.00	93.7
# 30	5.08	0.00	91.9
# 40	3.49	0.00	90.6
# 50	8.45	0.00	87.6
# 100	40.58	0.00	73.0
# 200	33.01	0.00	61.1

Hydrometer Analysis Data

Separation sieve is #10
Percent -#10 based upon complete sample= 94.8
Weight of hydrometer sample: 73.06
Hygroscopic moisture correction:
  Moist weight & tare = 386.71
  Dry weight & tare = 381.93
  Tare = 103.57
  Hygroscopic moisture= 1.7 %
Calculated biased weight= 75.77
Automatic temperature correction
  Composite correction at 20 deg C = -4.0

Meniscus correction only= 1.0
Specific gravity of solids= 2.50
Specific gravity correction factor= 1.038
Hydrometer type: 152H

Effective depth L= 16.294964 - 0.164 x Rm

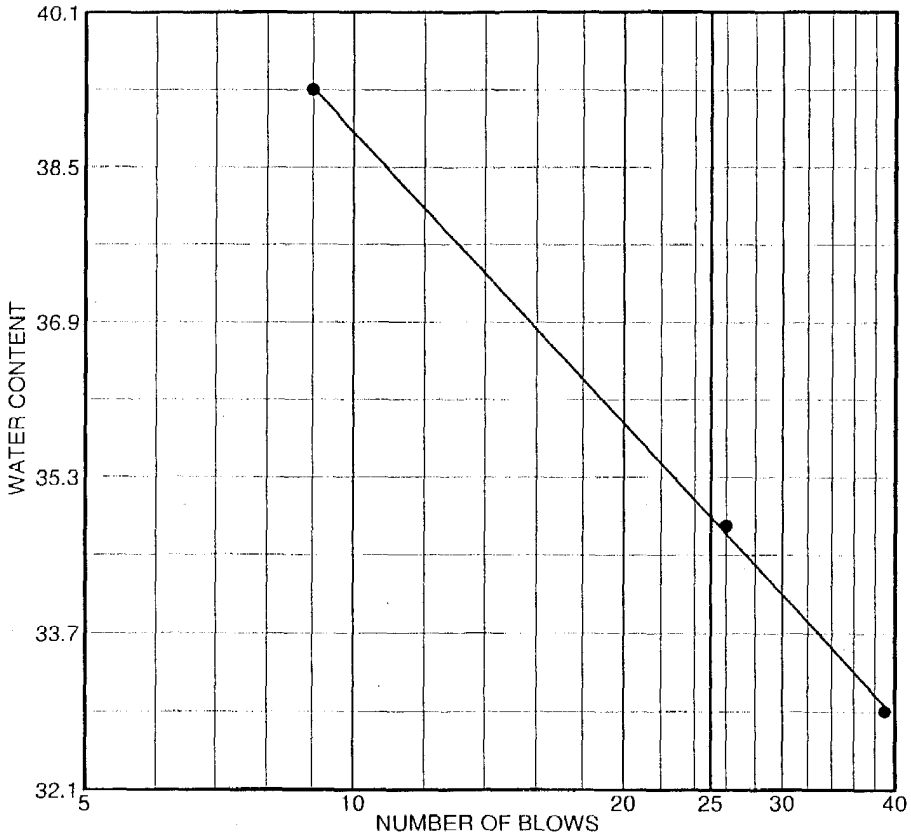
Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
1.00	23.0	47.0	43.7	0.0138	48.0	8.4	0.0400	59.8
2.00	23.0	43.0	39.7	0.0138	44.0	9.1	0.0294	54.3
5.00	23.0	41.0	37.7	0.0138	42.0	9.4	0.0189	51.6
10.00	23.0	39.0	35.7	0.0138	40.0	9.7	0.0136	48.9
15.00	23.0	37.0	33.7	0.0138	38.0	10.1	0.0113	46.1
30.00	23.0	35.5	32.2	0.0138	36.5	10.3	0.0081	44.1
60.00	23.0	34.0	30.7	0.0138	35.0	10.6	0.0058	42.0
250.00	23.0	30.0	26.7	0.0138	31.0	11.2	0.0029	36.5
1440.00	24.0	26.0	23.0	0.0136	27.0	11.9	0.0012	31.4

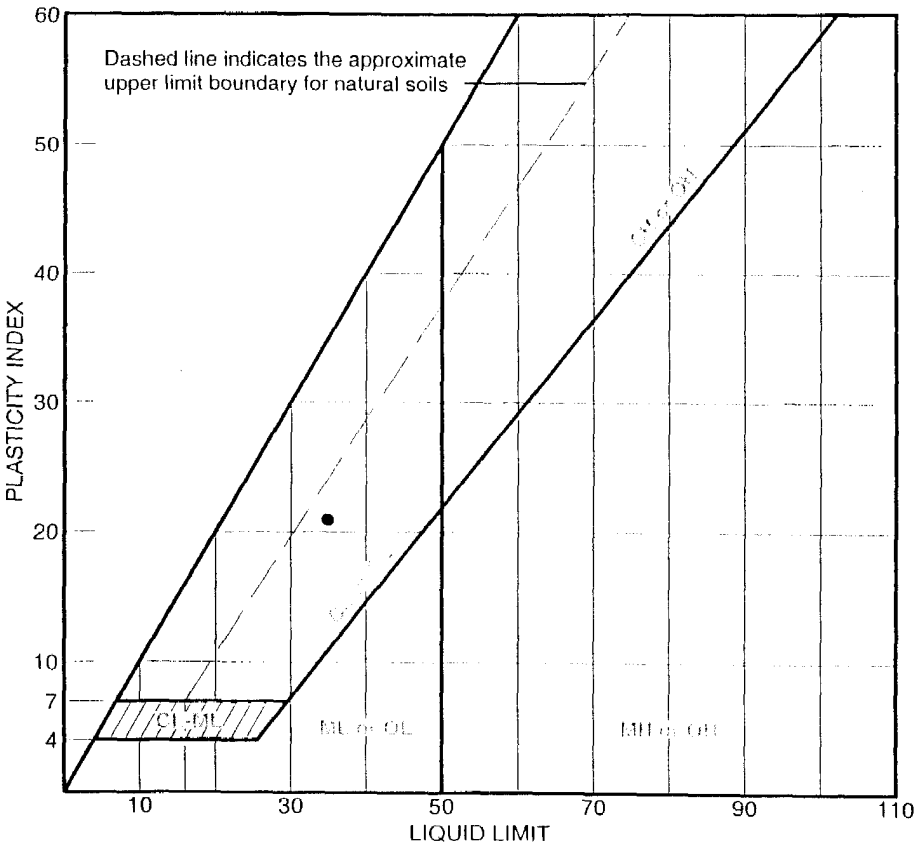
Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% + 3" = % GRAVEL = 4.0 (% coarse = % fine = 4.0)
% SAND = 34.9 (% coarse = 1.2 % medium = 4.2 % fine = 29.5)
% SILT = 20.3 % CLAY = 40.8

D_{85}= 0.26 D_{60}= 0.04 D_{50}= 0.01

LIQUID AND PLASTIC LIMITS TEST REPORT





	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PI
●	D&D TSF 06-26 soils		23.0' - 24.5'	6/9/03	CL	Sandy lean clay	17.3%	34.9	20.9

Client

Project

Project No. | Plate

INEEL MATERIALS LAB

● Sample #IRA17707PR sampled May 15th, 2003. Borehole #7 North

Lab Log #025

LIQUID AND PLASTIC LIMIT TEST DATA

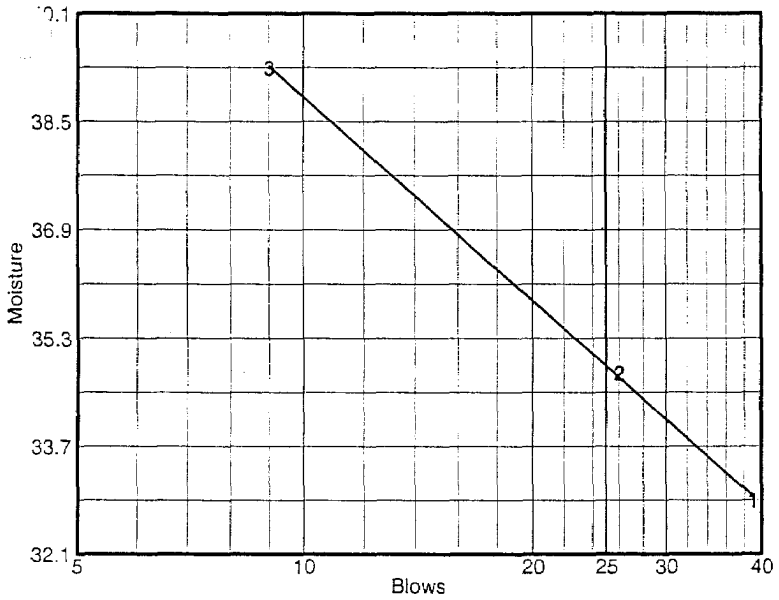
Client:
Project:
Project Number:

Sample Data

Source: D&D TSF 06-26 soils
Sample No.: 1RA17707PR
Elev. or Depth: 23.0' - 24.5' **Sample Length (in./cm.):** LL #025
Location:
Description: Sandy lean clay
Date: 6/9/03 **Natural Moisture:** 17.3%
USCS Class.: CL **AASHTO Class.:** A-6(10)
Testing Remarks: Sample #1RA17707PR sampled May 15th, 2003. Borehole #7 North Lab Log #025

Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare	22.88	23.03	24.71			
Dry+Tare	19.97	19.95	20.87			
Tare	11.12	11.10	11.09			
# Blows	39	26	9			
Moisture	32.9	34.8	39.3			

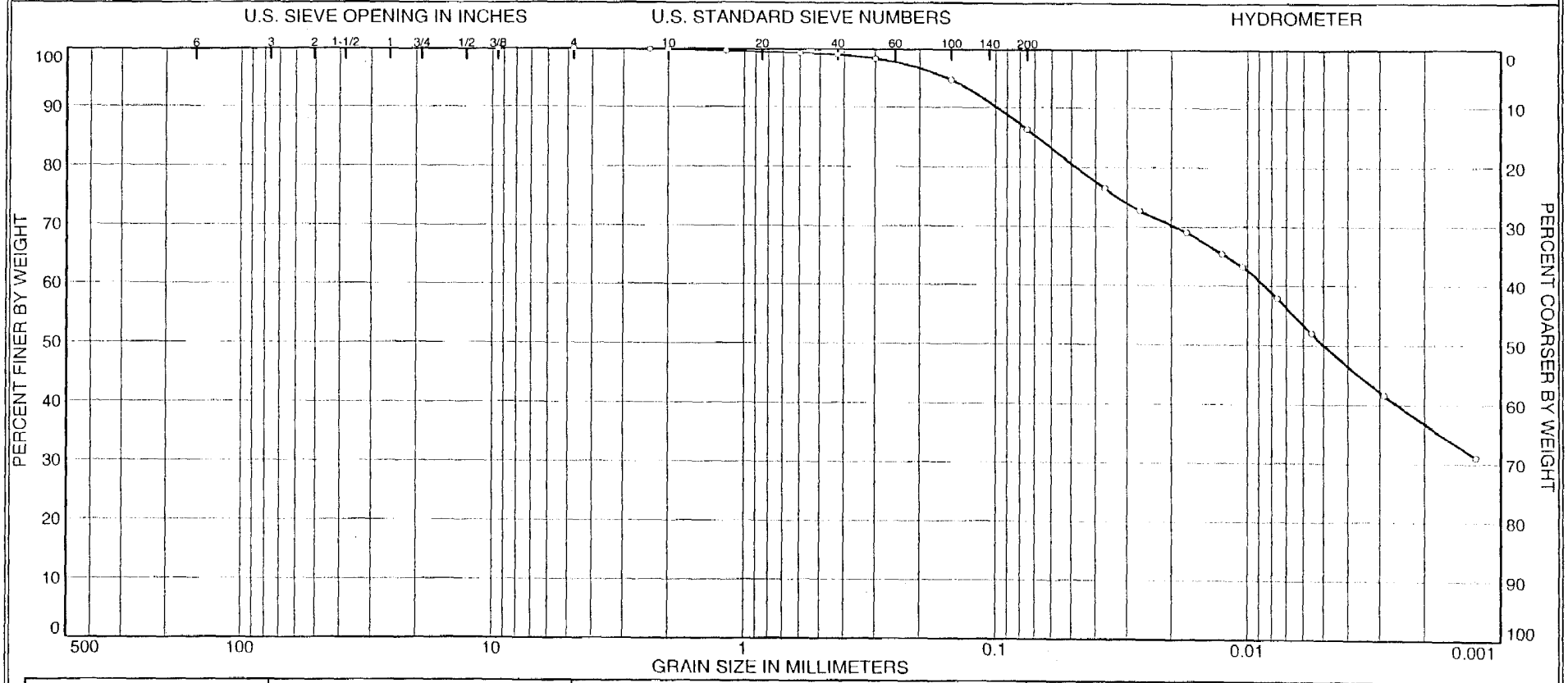


Liquid Limit= 34.9
Plastic Limit= 14.0
Plasticity Index= 20.9

Plastic Limit Data

Run No.	1	2	3	4
Wet+Tare	7.44	7.57		
y+Tare	7.06	7.17		
Tare	4.33	4.36		
Moisture	13.9	14.2		

PARTICLE SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.1	1.0	12.6	36.3	50.0

SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PL
D&D TSF 06-26 soils		1.5' - 3.0'	6/10/03	CL	Lean clay	10.1%	31.6	16.0

Client

Project

Project No. | Plate

INEEL MATERIALS LAB

Sample #IRA17601PR sampled May 14th, 2003. Borehole #1 South.

Lab Log #032

GRAIN SIZE DISTRIBUTION TEST DATA

Client:
Project:
Project Number:

Sample Data

Source: D&D TSF 06-26 soils
Sample No.: 1RA17601PR
Elev. or Depth: 1.5' - 3.0' **Sample Length (in./cm.):** LL #032
Location:
Description: Lean clay
Date: 6/10/03 **Natural Moisture:** 10.1%
Liquid Limit: 31.6 **Plastic Limit:** 16.0 **USCS Class.:** CL
Testing Remarks: Sample #1RA17601PR sampled May 14th, 2003. Borehole #1 South.

Lab Log #032

Mechanical Analysis Data

	Initial
Dry sample and tare=	486.91
Tare =	105.32
Dry sample weight =	381.59

Sieve tare method

Sieve	Weight retained	Sieve tare	Percent finer
3/8 inch	0.00	0.00	100.0
# 4	0.00	0.00	100.0
# 8	0.36	0.00	99.9
# 10	0.08	0.00	99.9
# 16	1.06	0.00	99.6
# 30	1.53	0.00	99.2
# 40	1.11	0.00	98.9
# 50	2.80	0.00	98.2
# 100	13.56	0.00	94.6
# 200	31.72	0.00	86.3

Hydrometer Analysis Data

Separation sieve is #10
Percent -#10 based upon complete sample= 99.9
Weight of hydrometer sample: 71.02
Hygroscopic moisture correction:
  Moist weight & tare = 491.62
  Dry weight & tare = 486.91
  Tare = 105.32
  Hygroscopic moisture= 1.2 %
Calculated biased weight= 70.22
Automatic temperature correction
  Composite correction at 20 deg C = -4.0

Meniscus correction only= 1.0
Specific gravity of solids= 2.50
Specific gravity correction factor= 1.038
Hydrometer type: 152H
  Effective depth L= 16.294964 - 0.164 x Rm

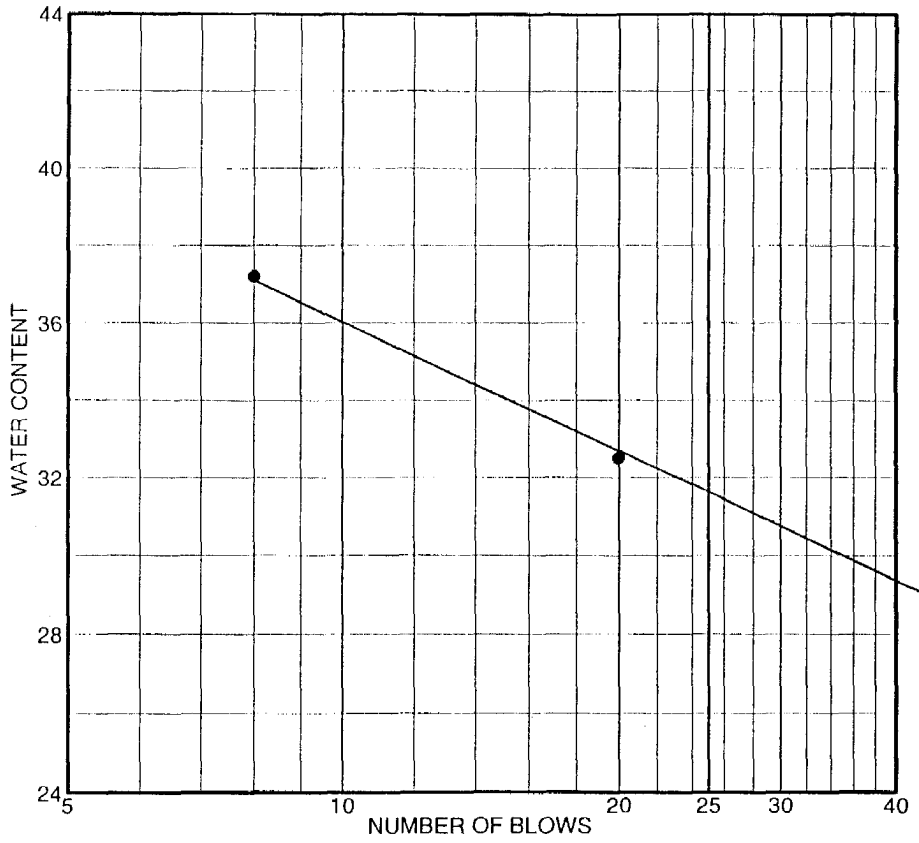
Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
1.00	23.0	55.0	51.7	0.0138	56.0	7.1	0.0368	76.4
2.00	23.0	52.5	49.2	0.0138	53.5	7.5	0.0268	72.7
5.00	23.0	50.0	46.7	0.0138	51.0	7.9	0.0174	69.0
10.00	23.0	47.5	44.2	0.0138	48.5	8.3	0.0126	65.3
15.00	23.0	46.0	42.7	0.0138	47.0	8.6	0.0104	63.1
30.00	23.0	42.5	39.2	0.0138	43.5	9.2	0.0076	57.9
60.00	23.0	38.5	35.2	0.0138	39.5	9.8	0.0056	52.0
250.00	23.0	31.5	28.2	0.0138	32.5	11.0	0.0029	41.6
1440.00	24.0	24.0	21.0	0.0136	25.0	12.2	0.0013	31.0

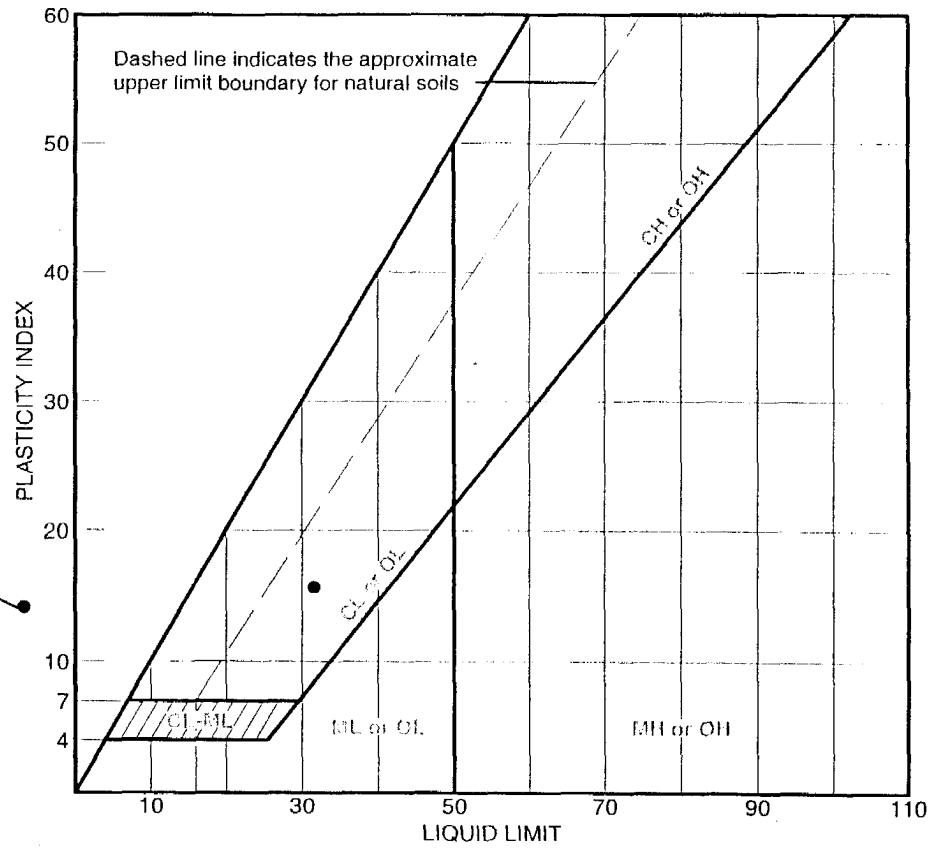
Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% + 3" = % GRAVEL =
% SAND = 13.7 (% coarse = 0.1 % medium = 1.0 % fine = 12.6)
% SILT = 36.3 % CLAY = 50.0

D_{85}= 0.07 D_{60}= 0.01 D_{50}= 0.00

LIQUID AND PLASTIC LIMITS TEST REPORT





	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PI
●	D&D TSF 06-26 soils		1.5' - 3.0'	6/10/03	CL	Lean clay	10.1%	31.6	15.6

Client

Project

Project No. | Plate

INEEL MATERIALS LAB

● Sample #IRA17601PR sampled May 14th, 2003. Borehole #1 South.
Lab Log #032

LIQUID AND PLASTIC LIMIT TEST DATA

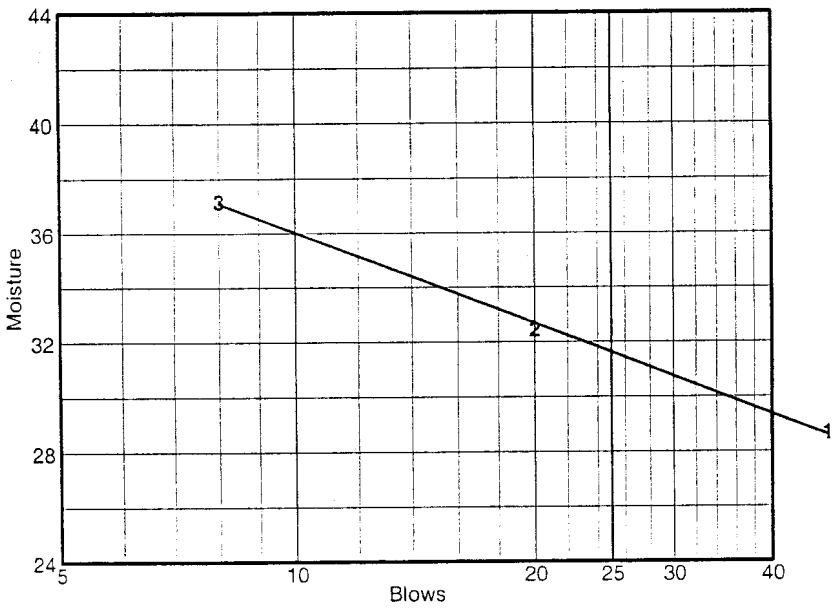
Client:
Project:
P ject Number:

Sample Data

Source: D&D TSF 06-26 soils
Sample No.: 1RA17601PR
Elev. or Depth: 1.5' - 3.0' **Sample Length (in./cm.):** LL #032
Location:
Description: Lean clay
Date: 6/10/03 **Natural Moisture:** 10.1%
USCS Class.: CL **AASHTO Class.:** A-6(12)
Testing Remarks: Sample #1RA17601PR sampled May 14th, 2003. Borehole #1 South. Lab Log #032

Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare	24.75	24.67	25.01			
Dry+Tare	21.70	21.33	21.25			
Tare	11.07	11.06	11.13			
# Blows	47	20	8			
Moisture	28.7	32.5	37.2			

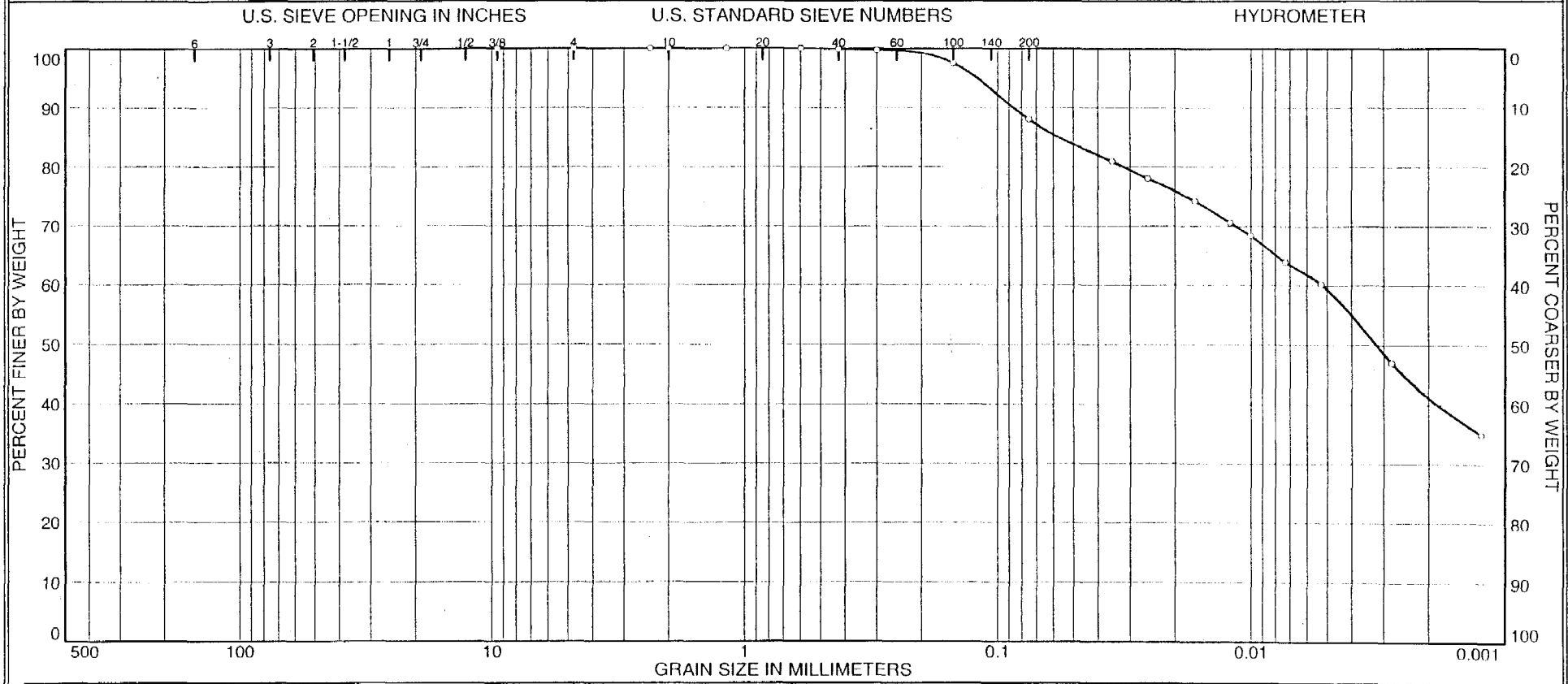


Liquid Limit= 31.6
Plastic Limit= 16.0
Plasticity Index= 15.6

Plastic Limit Data

Run No.	1	2	3	4
Wet+Tare	9.62	9.41		
Dry+Tare	8.89	8.70		
Tare	4.30	4.31		
Moisture	15.9	16.2		

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL		% SAND			% FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	0.0	0.0	0.1	11.9	28.7	59.3

	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PL
○	D&D TSF 06-26 soils		5.0' - 6.5'	6/10/03	CL	Lean clay	12.9%	31.9	16.1

Client

Project

Project No. | Plate

INEEL MATERIALS LAB

○ Sample #1RA17602PR sampled May 14th, 2003. Borehole #2 South.

Lab Log #033

GRAIN SIZE DISTRIBUTION TEST DATA

Client:
Project:
Project Number:

Sample Data

Source: D&D TSF 06-26 soils
Sample No.: 1RA17602PR
Elev. or Depth: 5.0' - 6.5' **Sample Length (in./cm.):** LL #033
Location:
Description: Lean clay
Date: 6/10/03 **Natural Moisture:** 12.9%
Liquid Limit: 31.9 **Plastic Limit:** 16.1 **USCS Class.:** CL
Testing Remarks: Sample #1RA17602PR sampled May 14th, 2003. Borehole #2 South.

Lab Log #033

Mechanical Analysis Data

	Initial
Dry sample and tare=	380.60
Tare =	106.36
Dry sample weight =	274.24

Sieve tare method

Sieve	Weight retained	Sieve tare	Percent finer
3/8 inch	0.00	0.00	100.0
# 4	0.00	0.00	100.0
# 8	0.00	0.00	100.0
# 10	0.00	0.00	100.0
# 16	0.03	0.00	100.0
# 30	0.06	0.00	100.0
# 40	0.15	0.00	99.9
# 50	0.58	0.00	99.7
# 100	6.03	0.00	97.5
# 200	26.04	0.00	88.0

Hydrometer Analysis Data

Separation sieve is #10
Percent -#10 based upon complete sample= 100.0
Weight of hydrometer sample: 71.70
Hygroscopic moisture correction:
  Moist weight & tare = 386.01
  Dry weight & tare = 380.60
  Tare = 106.36
  Hygroscopic moisture= 2.0 %
Calculated biased weight= 70.31
Automatic temperature correction
  Composite correction at 20 deg C = -4.0

Meniscus correction only= 1.0
Specific gravity of solids= 2.50
Specific gravity correction factor= 1.038
Hydrometer type: 152H
  Effective depth L= 16.294964 - 0.164 x Rm

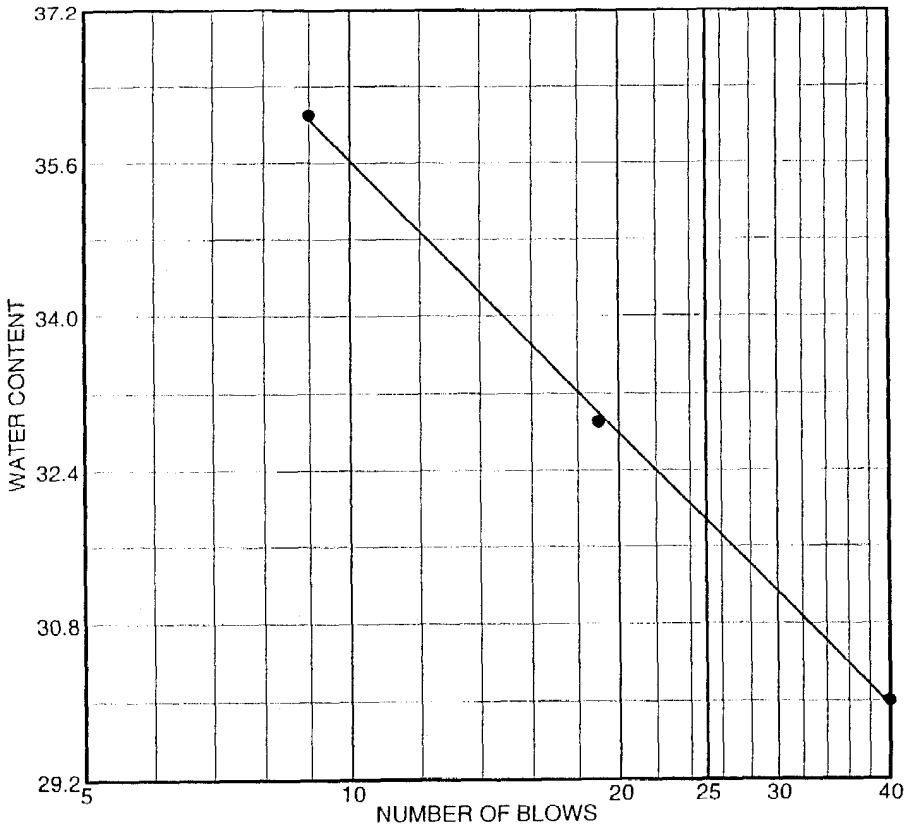
Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
1.00	23.5	58.0	54.8	0.0137	59.0	6.6	0.0353	80.9
2.00	23.5	56.0	52.8	0.0137	57.0	6.9	0.0256	78.0
5.00	23.5	53.5	50.3	0.0137	54.5	7.4	0.0166	74.3
10.00	23.5	51.0	47.8	0.0137	52.0	7.8	0.0121	70.6
15.00	23.5	49.5	46.3	0.0137	50.5	8.0	0.0100	68.4
30.00	23.5	46.5	43.3	0.0137	47.5	8.5	0.0073	63.9
60.00	23.5	44.0	40.8	0.0137	45.0	8.9	0.0053	60.2
250.00	23.5	35.0	31.8	0.0137	36.0	10.4	0.0028	47.0
1440.00	23.0	27.0	23.7	0.0138	28.0	11.7	0.0012	34.9

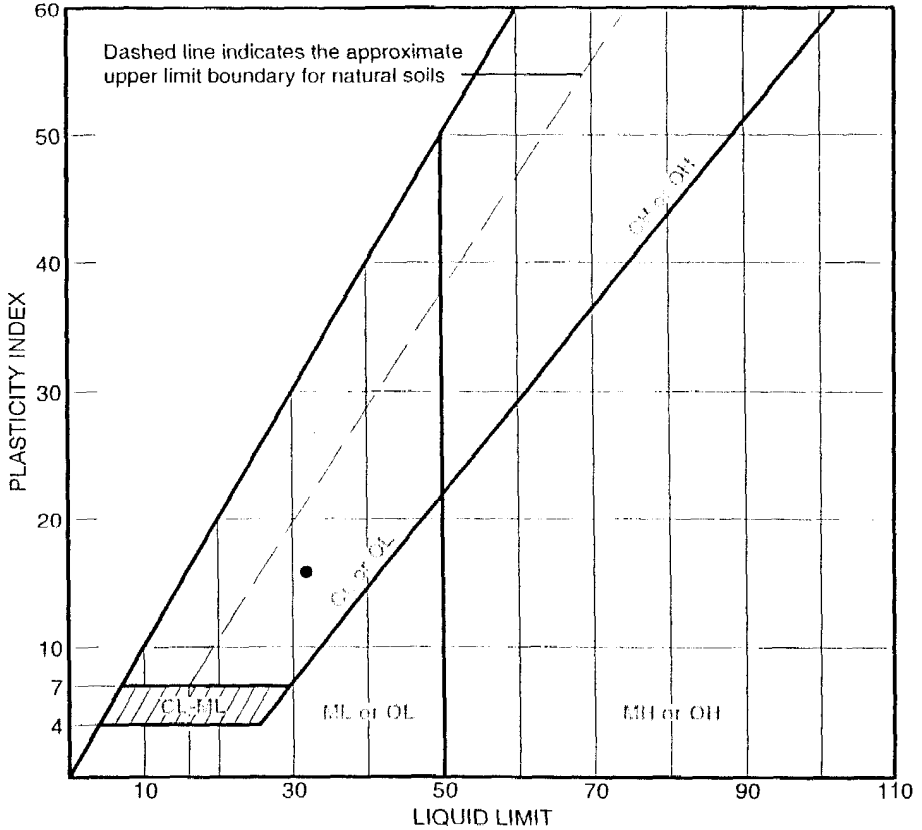
Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% + 3" = % GRAVEL =
% SAND = 12.0 (% coarse = 0.0 % medium = 0.1 % fine = 11.9)
% SILT = 28.7 % CLAY = 59.3

D_{85}= 0.06 D_{60}= 0.01 D_{50}= 0.00

LIQUID AND PLASTIC LIMITS TEST REPORT





	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PI
●	D&D TSF 06-26 soils		5.0' - 6.5'	6/10/03	CL	Lean clay	12.9%	31.9	15.8

Client

Project

Project No. | Plate

INEEL MATERIALS LAB

● Sample #IRA17602PR sampled May 14th, 2003. Borehole #2 South.
Lab Log #033

LIQUID AND PLASTIC LIMIT TEST DATA

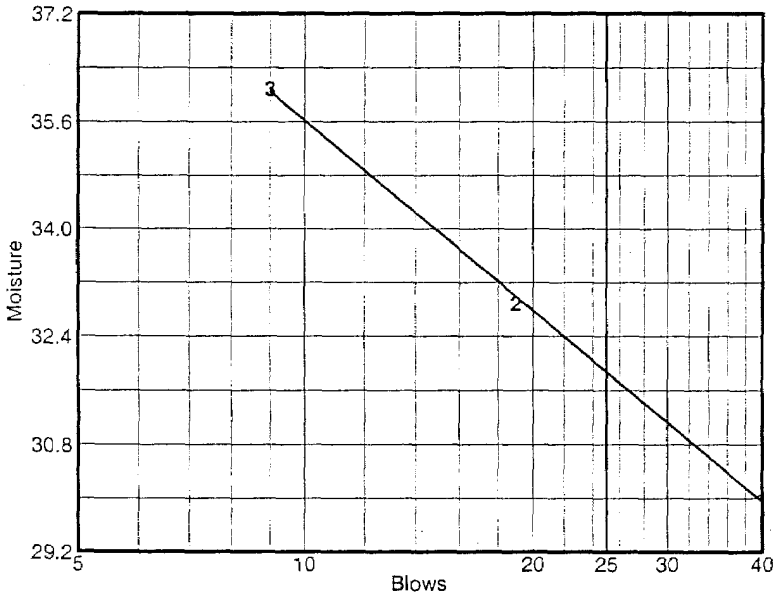
Client:
Project:
Project Number:

Sample Data

Source: D&D TSF 06-26 soils
Sample No.: 1RA17602PR
Elev. or Depth: 5.0' - 6.5' **Sample Length (in./cm.):** LL #033
Location:
Description: Lean clay
Date: 6/10/03 **Natural Moisture:** 12.9%
USCS Class.: CL **AASHTO Class.:** A-6(13)
Testing Remarks: Sample #1RA17602PR sampled May 14th, 2003. Borehole #2 South. Lab Log #033

Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare	29.52	28.09	30.32			
Dry+Tare	25.99	24.75	26.05			
Tare	14.24	14.60	14.23			
# Blows	40	19	9			
Moisture	30.0	32.9	36.1			



Liquid Limit= 31.9
Plastic Limit= 16.1
Plasticity Index= 15.8

Plastic Limit Data

Run No.	1	2	3	4
Wet+Tare	8.73	8.64		
Dry+Tare	8.13	8.04		
Tare	4.39	4.36		
Moisture	16.0	16.3		